HORSELESS AGE — The oldest automotive paper published in the English language has been purchased by The Class Journal Co. Its engineering features, and a part of its circulation, have been merged with — AUTOMOTIVE INDUSTRIES

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The AUTOMOBILE

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No. 3

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The AUTOMOBILE

VOL. XXXIX NEW YORK—THURSDAY, JULY 18, 1918—CHICAGO NO. 3

Commercial Aviation in Our Foreign Trade

Mail Parcel Post and Light Express Service to Europe and South America a Certainty—Quick Conversion of Fighting Planes to Planes of Commerce

ALTHOUGH no definite program for industrial reconstruction measures following the close of the war has been formulated, industries are already looking forward to that period. This is especially true of the aircraft manufacturer who is preparing for the greatest possible output and who recognizes that with the close of the war the demand for planes will quickly cease unless industrial consuming channels are developed. Already England has announced what might be taken as an indication of her aerial policy. She has planned mail routes by air from London to Australia by way of India, which will bring Bombay, Sydney and Melbourne a matter of days from London as compared with weeks. These will be extended to Canada, Africa and some islands of the ocean.

Reports filtering from Germany indicate that she is awake to aviation possibilities in commerce after the war. It is reported she already has blueprints of huge commercial machines for long-distance flying that will not be limited to mail routes or parcel post service, but that are ideally suited for light express matter.

Germany a Serious Trade Rival

The value of such a program in controlling foreign trade cannot be over estimated. Germany must be looked upon as a serious trade rival. This is chiefly true in aviation because she has been a leader in standardizing aircraft. The work of America in standardizing automobiles has proved an object lesson to Germany. Germany seems to have taken our standardization lesson, hook, bait and sinker for her commercial aviation program. She has standardized her war airplane program. This will make her a trade factor of first importance and one that we cannot afford to stand idly by and passively watch.

Commercial Airplane Service Needed

The necessity of commercial airplane service as related to the United States must not be overlooked. With South America there is urgent need for such a mail service. There is a broad field for such a parcel post service and there is almost a limitless field for such a service as carrying light express and merchandise.

Take the case of Argentina as an example of how an air service can work out. At present the City of Buenos Aires is approximately 22 days by steamboat from New York. There is no reason why these 6000 miles should not be covered in 15 days or perhaps 17 were fast steamboat lines organized. Undoubtedly competition after the war will bring such about. But 2 weeks from New York to Buenos Aires is a slow mail service for the conduct of important business. This means an inside limit of 6 weeks from the time a letter leaves an inland manufacturing city in America until a reply can be received from a merchant in Buenos Aires. There is not sufficient flexibility in this for good business

transactions. Cable rates are almost prohibitive, but while cables are largely used they are resulting in an increase of the retail price of American commodities in Argentina, which is not good business in meeting the products of cheaper European labor. Cable charges of over $50 have been added to some retail automobile prices in a few cases.

With an airplane mail service covering the 6000 miles between New York and Buenos Aires, it will be possible to cut the present 22 days to at least 5 or 6 days at the outside. This means one-third the time required for mail that is needed at present. The value of this saving of time is almost incalculable to the American merchant as well as to the Argentine merchant.

Airplane Must Supplement Ships

It will be literally impossible for America to establish its trade supremacy in South America and hold that trade which has been handed to us by the war without meeting our European competitors on the same basis of mail service that Europe will offer. Our increased number of merchant ships will not be sufficient to offset the advantage that an aerial mail service will give to Europe.

The conclusion of the war will without doubt find us with great shipping facilities. Our present shipbuilding program, together with the curb on the submarine indicates this. We must prepare to use this shipping tonnage to the greatest advantage. The airplane must supplement the cable service and the boat service in this respect.

Crossing the North Atlantic in an airplane has taken the spot-light position of accomplishment which for years was occupied by the North Pole. The person first crossing the North Atlantic in an airplane will compare with Peary, Scott, Amundsen and other great Polar discoverers. Conviction is gaining every week that the flight across the North Atlantic may be an accomplishment before the end of the year. Already rewards of $60,000 have been offered for the first aviator making such a flight.

Flight to South America is Simple

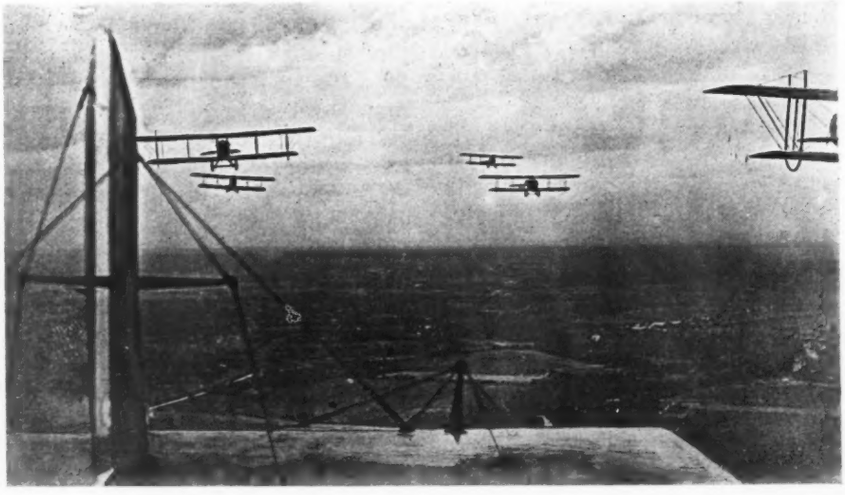
The airplane flight to South America should be much safer and much simpler than that across the North Atlantic. The heavy seas and storms of the North Atlantic are entirely lacking in the equatorial Atlantic. For days this part of the ocean is as calm as a mill-pond. This is of great value in trans-ocean flying. Undoubtedly the shoreline route could be followed once the South American continent is reached, which would be at some point adjacent to the Amazon or further north if necessary. Land routes across South America would be very difficult because of the sparsely populated areas of country and the lack of competent repairmen to care for a machine. On the other hand, the coast-line route should be relatively safe for large hydroplanes or flying boats.

Airplanes designed for war work would be readily convertible into vehicles of commerce. The conversion is much easier than that for land vehicles. It is rather difficult to adapt a land vehicle such as a tractor intended for hauling field guns over soft land into any useful field of commerce because these tractors would scarcely be used under anything approaching parallel conditions in peace times. With the airplane the conversion is different. They all travel through the air. It will simply be a question of changing the arrangements for carrying the load and load space. A machine adapted for carrying large quantities of bombs can, without great difficulty, be converted into a plane suited for carrying mails or express. This service gives indication of being a channel through which quick use can be made of our great quantities of bombing planes that are now being planned to manufacture. It will also apply to the larger or super-bombers which may be brought out before the termination of the war.

Trade conditions between Europe and America, which are certain to follow the war, will be vastly altered because of airplane service. So far as commerce is concerned the week will be reduced to a day. Mails which formerly took a week from New York to London, Paris and Berlin will be carried in a day. Undoubtedly valuable express packages will be similarly accelerated in transit. It is almost impossible to conceive the advantage that one country will have which possesses such service on a commercial basis over other countries that are not prepared to meet it.

Military Planes To Become Merchant Planes

Once the North Atlantic has been bridged, so to speak, by the airplane, a new military relationship will have been set up. The isolation of America by the North Atlantic will have ceased to exist. Within 24 hours a hostile nation in Europe will be able to seriously injure, and to quite an extent destroy the industrial portions of some cities. America must build to meet these requirements. Military planes of today will be merchant planes of peace days.



American training planes flying in formation at Kelly Field, San Antonio, Tex.

The Effect of Long Working Hours on Industrial Efficiency

Indications and Measurement of Fatigue—How Hourly and Total Output Have Been Increased by a Reduction of Hours of Labor—Some Recent British Experiments

THAT the initial indications of fatigue and the correct measurement of its extent at any moment lie in its objective rather than in its subjective symptoms is one of the first principles of industrial efficiency in so far as it pertains to the individual operative. In determining when fatigue begins to affect the efficiency of an operative or a group of operatives or the amount that that efficiency has been impaired by it, the thing to be studied is not the operative but rather production, the output for some definite unit of time.

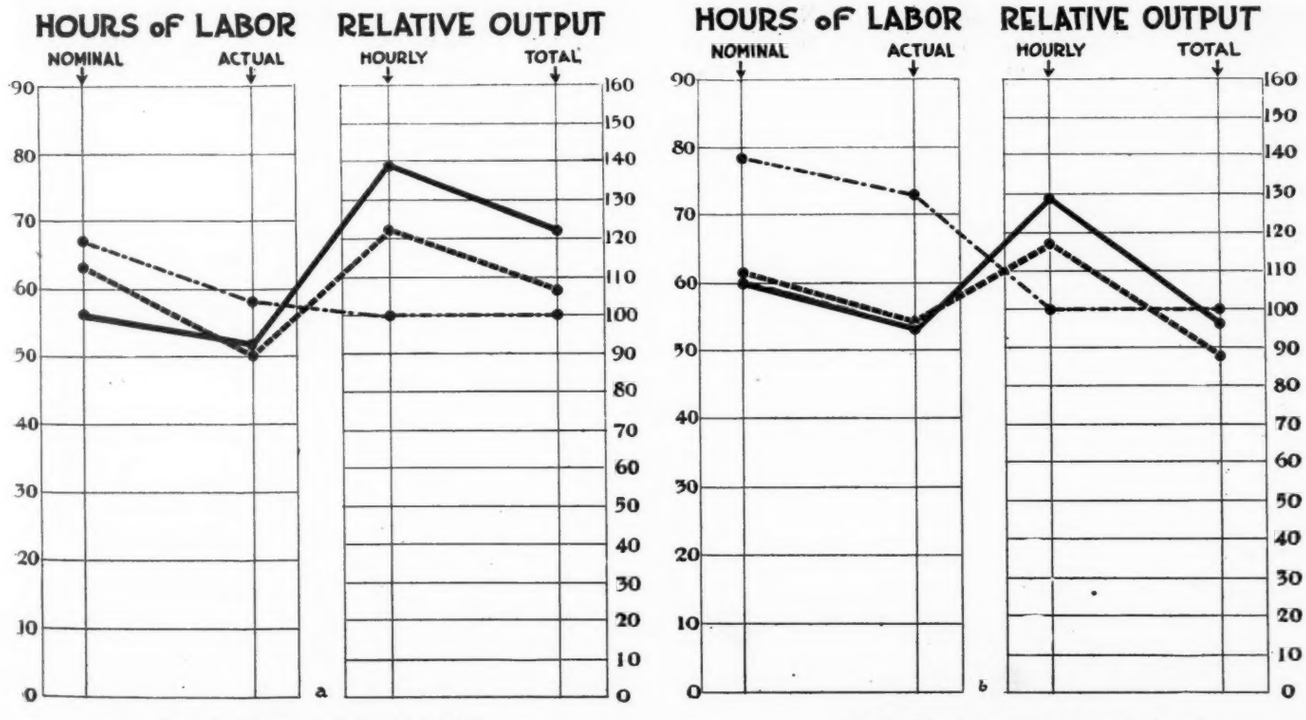
Before an operative *feels* tired physically or mentally he *is* tired industrially. His capacity to produce is reduced perceptibly before the subjective symptoms of fatigue are evident in his bodily sensations. Industrial fatigue is usually fatigue of the nervous system, not muscular fatigue, and it is caused not by the exhaustion of a latent supply of energy, as is sometimes thought, but rather by an accumulation of the products of chemical changes involved in physical exertion.

Fatigue is cumulative in effect, if sufficient rest intervals are not provided between periods of work. Opportunity must be given for the dissipation of the products accumulated within the system during the hours of labor. Accumulated fatigue, the result of a continued overtaxing of an individual's capacity, affects other portions of the nervous system and may cause, and usually does, a diminished quickness of response and a dulling of the senses of sight or hearing. These correlated symptoms indicate what is known as associated fatigue and are forerunners, not easily detected, of the more apparent indications of staleness which is commonly observed where hours of labor are too long, rest intervals too short and holidays or "days off" not sufficiently frequent.

Where staleness exists there will also be found poor "time-keeping," as the British call it, and a marked tendency toward a general indulgence in more strong drink than is good for the well-being of the worker.

It is because of these facts that beneficial results measured in terms of output capacity have been observed, in many cases, when the length of working hours has been reduced and the length of rest intervals and frequency of holidays increased.

In connection with munition work, the British Health of Munition Workers has made a most thorough study of



Case 1—Women turning fuse bodies

Case 2—Women cutting a screw thread

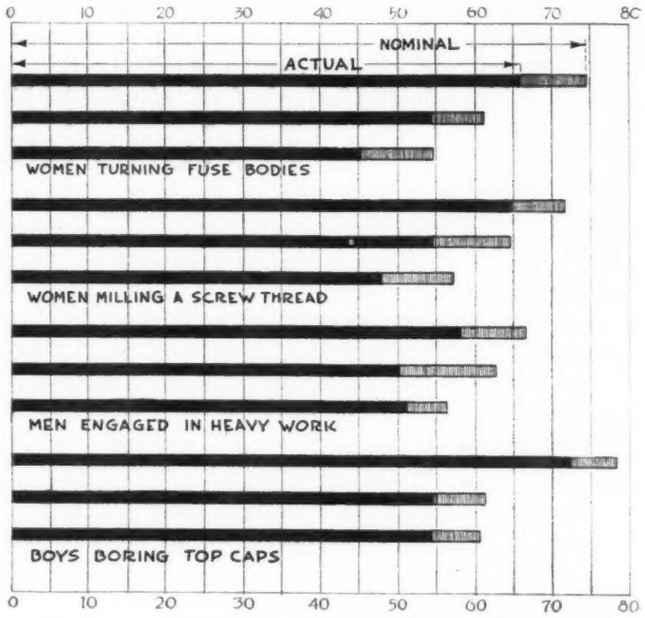
The four points in each of the three test periods on the two scales for each case are connected together by distinguishing lines, the lighter broken line being used to connect the points for the first period, the heavy broken line, to connect the points for the second period and the continuous line to connect the points for the third period. By following these lines the relationship of the nominal and actual hours of labor and the relative hourly and total outputs for each period may easily be observed and comparison made with the other periods

the effects of hours of labor on production and has developed some most interesting illustrations of what can be done toward increasing general industrial efficiency by decreasing the length of time during which operatives are called upon or permitted to work.

They had a good opportunity to make improvement in conditions as they existed at the time the tests were begun and to observe the effect, in extreme cases at least, of the scientific application of easily discovered physiological facts to the problem of obtaining industrial efficiency. It was common for men to work 14 hours a day for 6 days of the week and then work 10 hours or so on Sunday. Women worked 12 hours a day. The hours of labor were so long when the country awoke to a realization of the fact that productive efficiency was being seriously impaired that the committee, in recommending a working week not to exceed 65 to 67 hours for men and 60 hours for women was urging such a material reduction that those not familiar with the reasons which prompted the recommendations felt that output would be sure to suffer.

Several concrete cases illustrating how both hourly output and total output were actually increased when the number of hours of the working week were reduced are shown on these pages by means of charts and comparative lines drawn to scale to represent relative lengths of working periods and quantities of output.

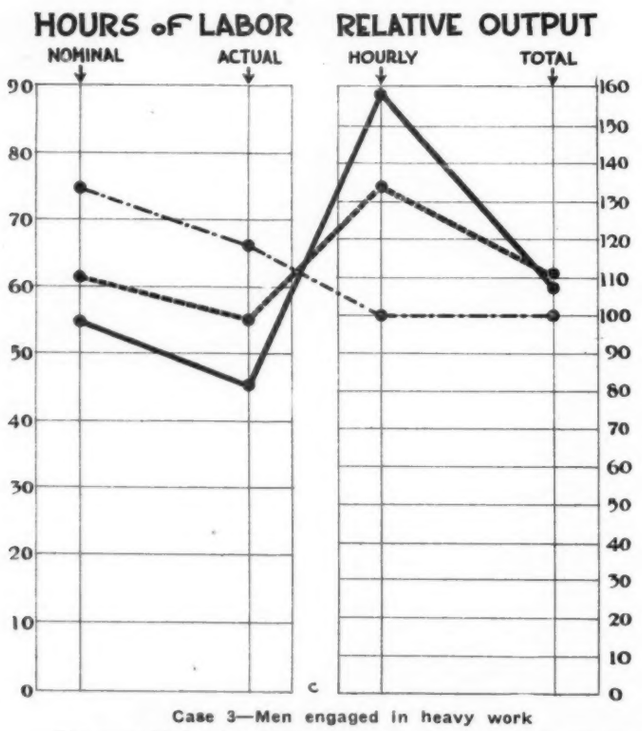
Even though we have long known that "all work and no play makes Jack a dull boy," the results obtained in some of these cases are little short of startling. This is true not only of the way in which output rate and total output increased when working hours were shortened, but in one of the cases it is also true of the manner in which the difference between nominal and working hours became smaller. In this particular case, which is that of men doing heavy work, there was a slight increase of actual hours of labor when the nominal hours were reduced below a certain point. Owing to a discontinuance of Sunday work, the general attendance of the operatives was



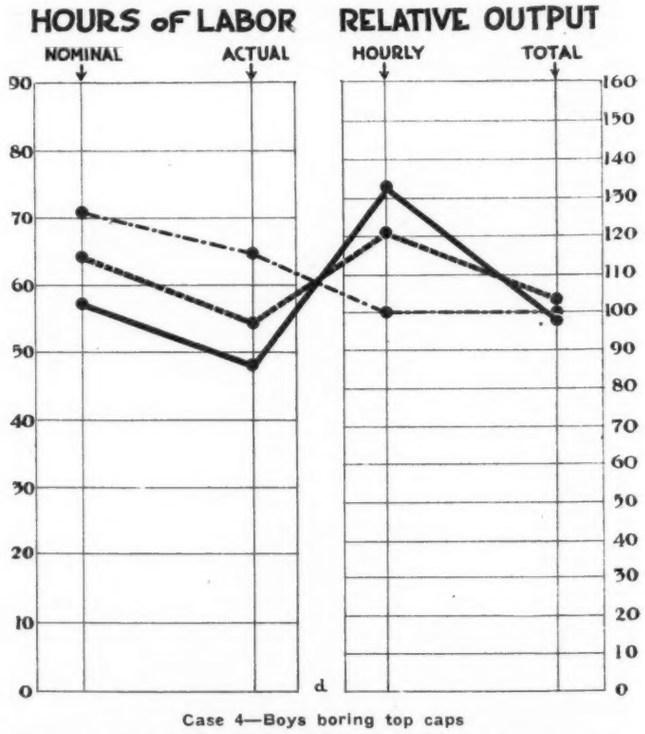
Showing the relationship of the actual working hours per week to the nominal as the number of hours in the working week was reduced in each of the four cases here considered

so much improved that the average for the actual hours worked was higher than it had been before.

It is not at all likely that we can secure so great a benefit from a reduction of working hours as they did in Great Britain because of the fact that our hours of labor are less per week on the average than they were and still are there. But there is food for serious thought in the experience of our British brothers and the suggestion, at least, that by giving more study to our own individual cases with British experiences in mind, we may be able still further to increase our industrial efficiency or at least



Case 3—Men engaged in heavy work



Case 4—Boys boring top caps

The same kinds of distinguishing lines are used in the diagrams above to connect the four points for each of the three test periods as are used in the illustrations for cases 1 and 2. The light broken line indicates the first period, the heavy broken line, the second period, and the continuous line the third period

avoid falling, as they did, into the mistaken belief that the way to increase output is to work longer on the job.

The data used in all of the cases taken up in the diagrams accompanying were gathered in large and recently constructed munitions plants in which the working conditions were as good as they are anywhere today. The lighting, heating and ventilation were provided by modern equipment and were regarded as fully adequate according to present standards. There were canteens where refreshments were obtainable and opportunity was provided for their use. All the operatives included were on piecework at a high rate and were not under trade union restrictions as to output. There was therefore every inducement and favorable conditions as to environment for maximum production.

In the first case women were engaged in turning aluminum fuse bodies which is rated as "moderately heavy labor." They stood all day at turret lathes and performed seven boring and cutting operations on each piece. The work required close and constant attention as much of it was of a delicate character and as a result there was no great opportunity for relaxation. One hundred women, each of whom had reached maximum production after approximately 3 weeks' training and some experience in the production department and had worked during at least 15 of the 24 weeks over which the tests extended, were included. Before the period during which the tests were made, working hours had usually been between 75 and 80 per week with no Sunday work in the second week of each month. In the case under consideration the first period was made up of 6 weeks and there was Sunday labor in five of them. During the second period of 8 weeks the women worked on three Sundays for a few hours each. Unfortunately for some reason the attendance was extremely poor during the third period, so much so that while the hourly output rate increased from 134 to 158, a jump of nearly 18 per cent, the relative total output fell from 111 to 109. If the ratio of actual hours to the nominal of the second period had been maintained in the third, and there seems to be no particular reason why it should not have been, the relative total output would have been increased from 111 for the second period to 117 for the third.

It was the conclusion of the committee that "a 50-hour week yields as good an output as a 66-hour week and a considerably better one than a 75-hour week" when women are engaged in moderately heavy lathe work.

We have, in the second case, an instance in which the rate of output is largely regulated by the speed of the machines employed. For four-fifths of the time the operatives stood idly by watching their semi-automatic machines run. Every minute or so they removed one fuse body and inserted a new one, an operation which required only a few seconds. The work was light and called for but little physical exertion and not such close application as did the turning of the fuse bodies considered in the first case. The period of this test was 24 weeks also and the work of twenty-one women was included. The hourly output varied very much as it did in the first case, but not to so great an extent, because, as has been pointed out, the speed of the machine was practically the determining factor.

It is in the third case—that of men engaged in heavy work—that the most interesting results were obtained. The work consisted of sizing fuse bodies. It is considered one of the most fatiguing kinds of munition work. Each piece is subjected to four separate operations. While no particular skill is required, a heavy continuous strain is imposed on the muscles of one arm and shoulder and also on the back. The lifting of the pieces is almost always done with one hand as the operators prefer to keep the other hand dry as it is used for running a tap through the piece to cut a thread and the oily condition of the piece makes it harder to do this if both hands are used in lifting it. The averages of twenty-seven men were used in making the calculations in this case.

A most interesting point in this case is that in spite of the fact that the nominal hours were reduced in the third period, the actual hours worked were more than they were in the second period. There were also some remarkable increases in relative hourly and total output. It will be noted that the relative hourly output increased from 100 to 122 and then to 139 when the nominal hours were reduced from 66.7 to 62.8 and then to 56.5 and that the relative total output increased from 100 to 106 and then to 122, the latter unusual jump being due in part to the increase in the actual hours worked.

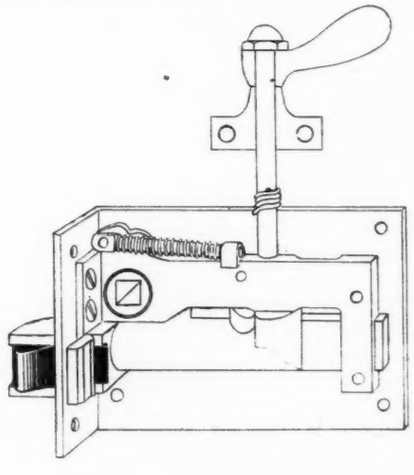
As only seventeen boys of from 15 to 18 years of age were included in the fourth case the data derived are not so comprehensive. The process on which the boys were engaged, namely, boring top caps, involved the use of semi-automatic machines and the speed of these machines very largely determined the rate of output. There were two clamping and unclamping operations every 15 seconds and these operations consumed about 2 seconds. A substantial increase was noted in relative hourly output with a reduction of hours of labor, but because attendance fell off for some unaccountable reason during the second period the relative total output also showed a decrease. In the third period with practically no change in hours from the second, the relative total output very closely approached that of the maximum working period.

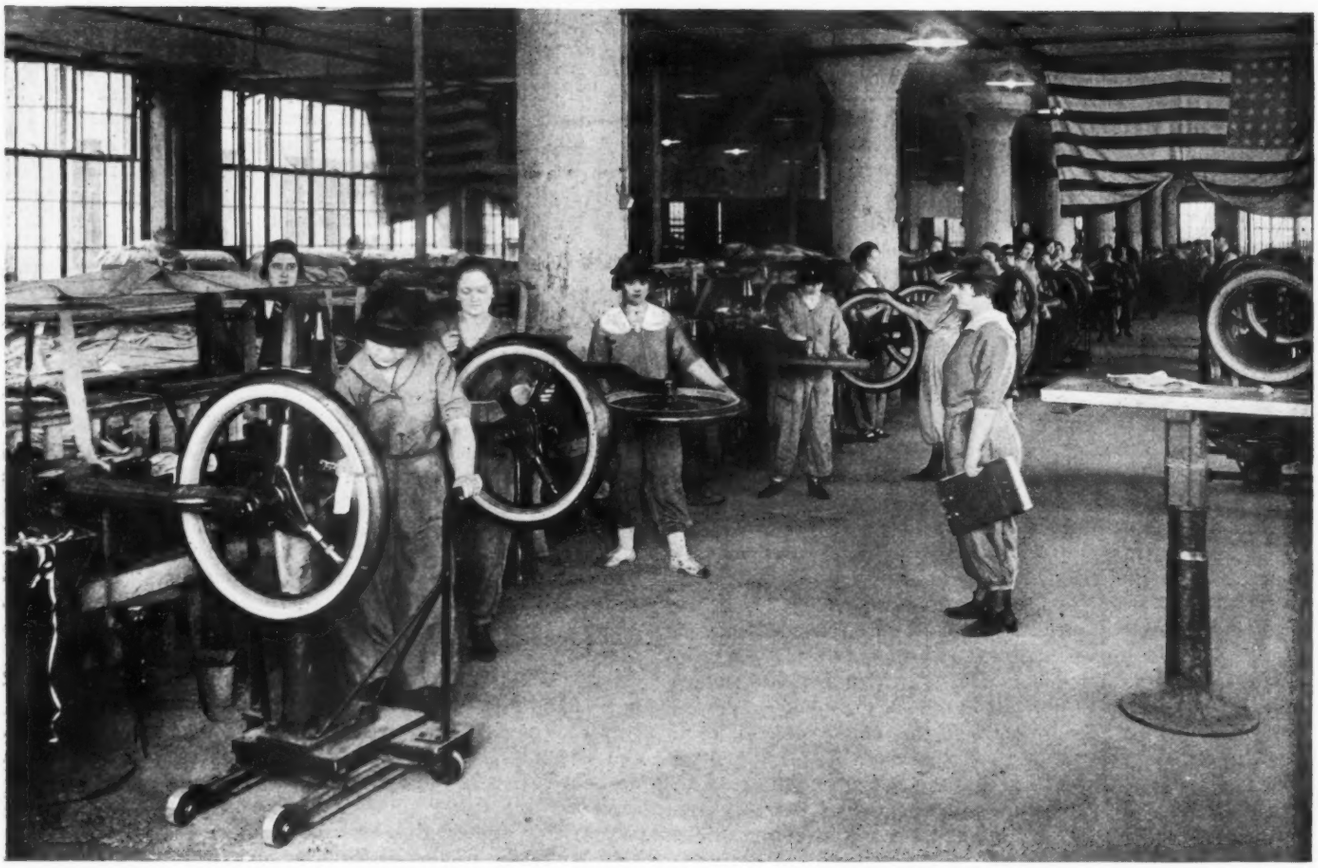
These and other similar tests convinced the British authorities that reductions of from 7 to 20 hours per week could be made below what had been considered the necessary working schedules for maximum production without loss of total output. They have accordingly revised their schedules and production is again expressed by an upward curve.

Anti-Rattling Door Lock

THE Ottinger anti-rattling device as incorporated in some of the locks manufactured by the English & Mersick Co., is designed to prevent door rattle without the use of rubber bumpers on the jamb. It consists of a cam inserted in the bolt, and the ejecting pressure behind the bolt is utilized to force the cam against the holding portion of the striker.

At the beginning of its movement the cam is embedded in the bolt so that there is no pressure to be overcome in opening or closing the door except that behind the bolt. It is not necessary to slam the door. As the bolt passes behind the striker the inner end of the cam is forced in and the outer end emerges from its recess in the bolt until it bears tightly on the striker, thus holding the door firmly.





With the aid of a lifting jack, women are able to work efficiently in the tire-finishing department of the Morgan & Wright plant

Improved Equipment of Additional

Morgan & Wright Have Installed Many

AT the plant of Morgan & Wright, in Detroit—a branch of the U. S. Tire Co.—women are employed in many departments where the work done taxed the endurance of the strong, able-bodied men who formerly did it. On the heavier work they are found not quite so efficient as men, but the company has been obliged to use them on such work because of the shortage of male help. All together there are employed in this plant 500 women who have taken the places of men, and it is the general opinion of those in charge of the various departments that they do the work better than the men did.

Through its development department the company is constantly improving its equipment with a view to reducing physical exertion as much as possible, not only for the benefit of the women but for the men as well. This improved equipment has already enabled the company to place women on certain kinds of work which were formerly of a character altogether too strenuous for them.

A trip through the factory discloses women engaged in a wide variety of occupations. They work in the tire-finishing room, in the flap department, in the wire room, in the department where cord tires are made, in the shipping room and warehouse; they make beads for tires, and work in various other capacities.

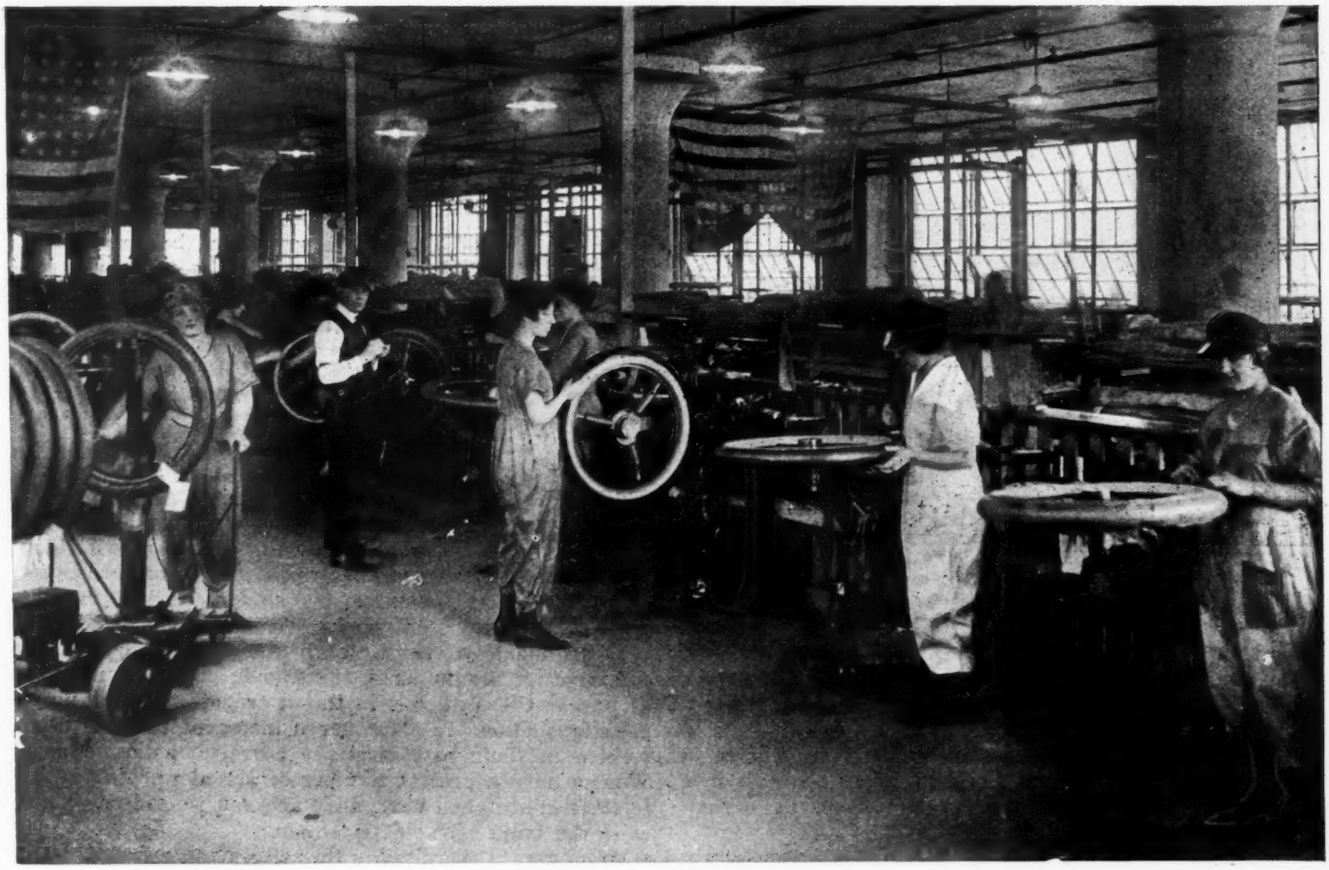
A striking example of what women can do in the way of hard physical labor is provided in the final inspection room. Here a pile of heavy tires is deposited at the feet of the women, from which they take one at a time and place it upright upon two large spools sunk in a table before which they work. The tires are revolved on the spools and carefully inspected for defects. The operation is repeated to inspect the other side, after which the tire is properly stamped and thrown on another pile.

Despite the fact that the weights of the tires vary from 14 to 20 lb. each, and that an average worker handles between 400 and 500 tires a day, the women find very little difficulty in the work. They lift nearly 8000 lb., or 4 tons, daily, and when it is remembered that this is only half of the operation, that it is necessary to throw the tires again on another pile after inspection, the task seems astounding. Yet they manage it with apparent ease.

With the aid of a lifting jack—a device developed from an idea of an employee—the physical effort required for the work in the finishing room was reduced to such a degree that the company was enabled to place women at work there. It may be mentioned here that the company encourages employees to make suggestions that facilitate work or result in its being done more efficiently. Awards are offered for the best suggestions.

The work in the tire-finishing department consists of applying several strips of fabric and gum over the tires as they come from the tire building room. Only 3, 3½ and 4-in. sizes are handled by women. The tires are brought into the department on trucks which are fitted with T-shaped steel uprights from which the tires are suspended. When the worker is ready to start on a new tire she approaches the loaded truck with a lifting jack.

As the worker turns a wheel at one side of the jack an arm is raised. This is guided under the nearest tire, lifting it off the T-shaped fixture on the truck. The lift-



When the tires are adjusted on the finishing buck, the worker is ready to apply three plies and four gum strips entirely by hand

Permits Employment Women Workers

Lifting Devices to Lighten Their Work

ing device, which is mounted on casters, is then pushed to the worker's bench; the tire is lowered, and transferred to what is called a finishing buck—a steel wheel having three weighted spokes. When properly adjusted on the finishing buck the woman starts at once to apply various layers of fabric. After three plies have been put on, four gum strips are next applied, the last of which is the tread.

All these operations are performed by hand. As each layer is applied the finishing buck is given a vigorous twist, causing it to revolve. While thus in motion a roller is held against the strip for the purpose of making the latter adhere securely. The edges are then cut off with a sharp knife. The next six layers are applied in the same manner. The lifting jack is again used in removing the tire and placing it on a truck.

This work was formerly done entirely by men; in fact, women have not replaced all the men in this department. There are still a number of men employed at this work. It was in this department that women were first introduced in the plant. This was in May, 1917, when several were taken on. They proved so satisfactory that the company was encouraged to add more from time to time, and now there are a large number engaged in this department on each shift.

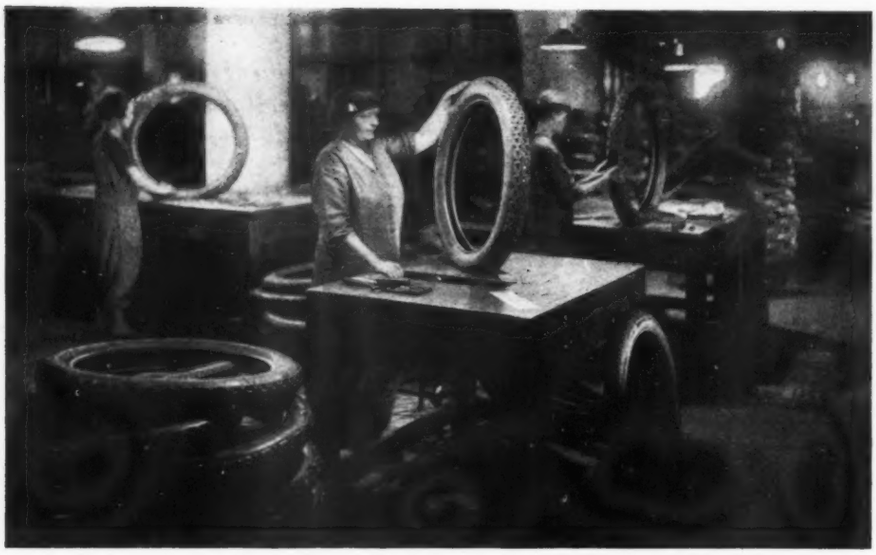
In connection with the work in the tire-finishing department women are also employed to supply the workers with stock. It is necessary for these stock girls, as they may be called, to be extremely familiar with the various kinds of strips and their names, so that when a worker calls for a certain kind there will be no delay in supplying him or her with the required piece. Women have completely replaced men in this line of work; they supply stock to men as well as to the women. This work is comparatively light, and can be performed satisfactorily.

To give the reader a clearer conception of the operator's work in the wire room, where the basis for beads is made, it may be well to first describe the machine on which the operation is performed.

The machine wraps with tape a coil of wire which passes over two spools, one above the other. In order to keep the wire taut while in the process of being wrapped, there must be a tension between the spools. This is accomplished at the will of the operator, who sits on a seat at the end of a bar projecting from the machine. This seat acts in conjunction with the lower spool. As the operator sits down her weight bears down the bar and simultaneously lowers the spool. When the bar is relieved of its weight, or, in other words, when the operator rises off the seat, the bar springs up, causing the spool to slide upward.

The spools must be in this relieved position to permit the coil of wire to be put over them. As soon as it is adjusted, the operator sits down, tightening the coil over the spools, and commences the operation of winding. Then the operator is obliged to stand up again before she can disengage the wrapped coil.

It takes less than 10 seconds to wrap a coil and about as long to release the finished coil and adjust a new one. This means that the operator must sit down and jump up once every 20 seconds, or three times a minute. This is



In the inspection room women examine first one side and then the other of each tire

equal to 180 times an hour, and, estimated on an 8-hr. basis, amounts to 1280 times that a woman must move up and down during a day's work. Women are as efficient as men in this work and are very rapid.

The coils of wire are made and soldered by women in the same room. The coiling is done by an operator in a standing position, while the work of soldering is accomplished by a seated worker.

The next two steps in the manufacture of beads, wrapping and trimming, are also performed by women. About six persons are used on this work in one shift.

Many women are employed in the pocket department, the latest department to experiment with the use of female labor. The most difficult task in this department is that of carrying what are called books. These consist of a supply of fabric for cord tires, placed in layers on boards about 8 ft. long. At first, every worker was obliged to handle her own supply of books. The women—one at each end—would carry these from the source of supply to their racks, but it was found later that this work was too heavy for women, so men are now used to carry the books for the women as they require them.

Work of Heavy Character

The work in this department consists of taking a piece of fabric from a book, cutting it the required length, and stretching it over a large drum of equal circumference, one layer over another, until a certain thickness is attained. These bands are then removed from the drum and conveyed to another department, where they are put over a tire core by men.

In other departments where women are employed the work is of lighter character. A number of women are engaged in the cutting of treads; several are used to trim the uneven fabric edges from the rubber tread, while others cement the ends together; another group makes patches for repair kits; still others stamp sizes and names on inner tubes, and others work in the packing room, where the product is boxed.

A great number of women are engaged as inspectors in numerous departments. As the finished casings are finally inspected they are sent to women who check their serial numbers and weigh each tire.

The company made extensive experiments with the training of help for the various kinds of work. Two years ago, with the training of men in mind, it established a vestibule school, but after 6 months' trial it was abandoned. It did not prove successful. Despite the fact that the vestibule idea is working to advantage in machine shops, it is felt by the company that it cannot be made to operate efficiently in the rubber industry. At the Morgan & Wright plant it was found better to train students among the other workers. The students develop faster, and have a greater opportunity to grasp efficient methods and acquire short cuts, which come to them more slowly in the vestibule school.

It was noted that students graduating from the school, when entering regular production, could not keep up with the supply of work; they were always behind. As they are now trained—with the regular workers—women are taken out of the student class after 6 or 7 weeks. It has been found that they are much quicker to learn than men.

Excepting the students, the women get the same rate of pay as the men, but in the aggregate their earnings are slightly less. In a number of instances, however, they receive in their pay envelopes as much as some men. Women have a greater number of actual working hours to their credit than men; they are much steadier. They work the same 8-hr. shifts as men.

Great care is exercised in the selection of women. Both the employment manager and the matron interview them. After being hired, a woman is taken by the matron to the department where she is assigned to work, and is made to feel as much at home as possible. There are two matrons, one for night duty, the other for day. The matron always aims to be with the girls at lunch hour. Special rest and locker rooms are provided, to which the women may retire at any time during their working hours.

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Employee Group Insurance

UNDER the shifting conditions existing to-day the employer is ready to adopt any good plan that promises to keep down his labor turnover. One of the latest and most popular forms of welfare work is group insurance. This new form of insurance was launched early in 1911.

Group insurance has been called "an employer-employee mutual benefit proposition," says a report of the Committee on Industrial Betterment of the National Association of Manufacturers. The plan contemplates that the employer shall insure his whole body of employees, as a group, bearing the entire cost of carrying the insurance, which is made especially low. If the group includes more than 100 a medical examination is not required. Of course, there must be no unusual hazards in the business, the factory conditions must be wholesome and the risks as a whole desirable.

Since the employer pays the insurance premium, the workman loses his insurance when he leaves his job. The new workman takes on insurance with his new position.

The unit for group insurance may be the year's salary or earnings up to $3,000 for any individual. It may be arranged for the beneficiary to receive this in twelve monthly payments, thus continuing the family income for a year after the death of the worker. Instead of the salary unit a fixed amount, as $500 or $1,000 may be taken for each individual. Where the smaller unit is taken there is usually a provision to increase the benefit $100 with each year of service until a certain limit has been reached.

A New Chassis Lubrication System

A Scheme by Which Oil Is Fed to Bearings by Wicks—Quantity Fed Is Regulated by Localized Compression of the Wicks—Large Supply of the Lubricant Easily Carried

FOR some time it has been apparent that a better lubricant than grease is desirable for such parts of passenger cars and trucks as spring bolts, brake shafts, brake connections, radius rod connections, drag links, spring shackles, etc.

The tendency of grease to harden in its way with age, as well as its tendency to take the path of least resistance when forced by pressure to bearing surfaces, have been serious drawbacks to its use as a chassis lubricant. The grease works out of the bearing, possibly at one of the ends, without being distributed over the surfaces to be lubricated, and it also works out of the grease cup around the cap.

Some of the materials used in making grease have very small lubricating value, if any, which means that not all of the material fed to bearing surfaces serves to lubricate them. A considerable amount of dirt of one kind or another is usually fed to the surfaces to be lubricated with the grease and, owing to the conventional manner of exposing the grease containers, in shops and garages, the efficiency of grease is farther reduced. There are other inconveniences connected with the use of grease. So many grease cups used on passenger cars and trucks are located so inaccessibly that they are slighted even by operators attempting to take proper care of them. It is a very laborious task to keep grease cups filled, and to screw them down as required, owing to the many points to be lubricated. These various difficulties have led many to investigate oil as a chassis lubricant, with a view to cutting down the number of points to be looked after in keeping a chassis lubricated, to secure capacity for lubricants to last a comparatively long time, and also to secure a lubricant that has a higher efficiency than grease.

Oil Not an Ideal Lubricant

Oil, while not an ideal chassis lubricant, possesses a certain number of outstanding characteristics that are not to be found in grease. It is easily distributed over bearing surfaces, is capable of sustaining very heavy bearing loads, reduces friction to a minimum, and is generally a better lubricant than grease. It can be fed in proportion to requirements, tending toward automatic lubrication; it admits of greater cleanliness; if necessary, sufficient lubricant can be carried for several weeks' requirement, and the same oil as used in the engine can be used throughout the car.

The chassis lubrication scheme illustrated by the accompanying drawings has been evolved by Carl S. Peterson, chief

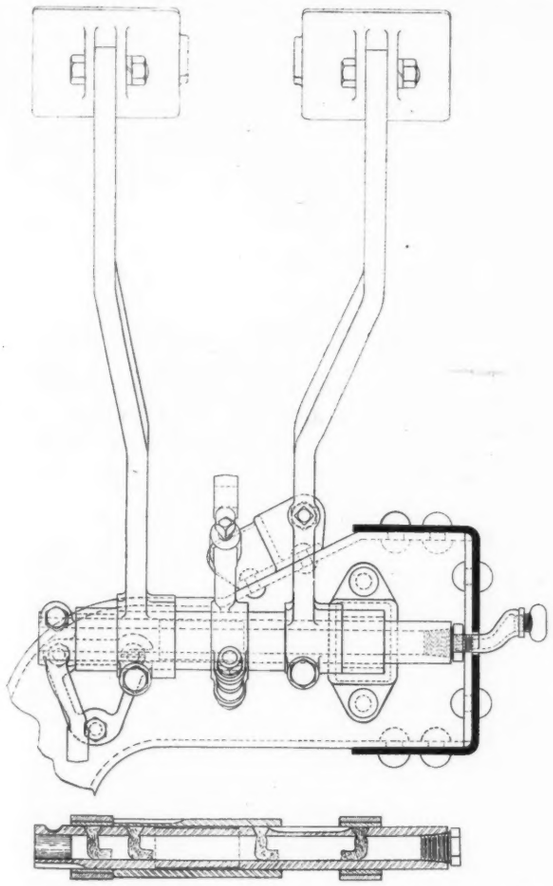
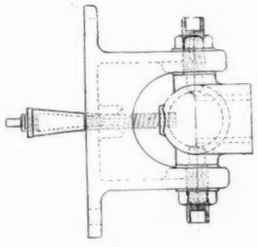


Fig. 1—Clutch and brake assembly showing four bearing surfaces lubricated from same reservoir with one point of filling



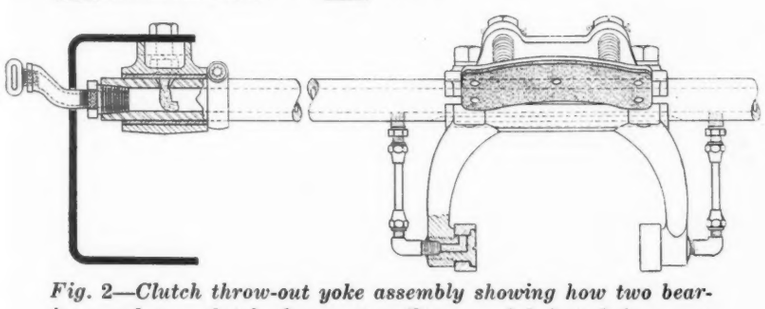


Fig. 2—Clutch throw-out yoke assembly showing how two bearings and two clutch throw-out rollers are lubricated from one reservoir with one point of filling

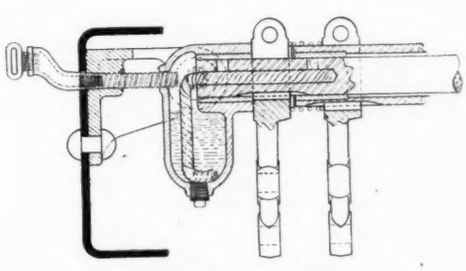


Fig. 5—The brake countershaft assembly in which oil is employed as a lubricant

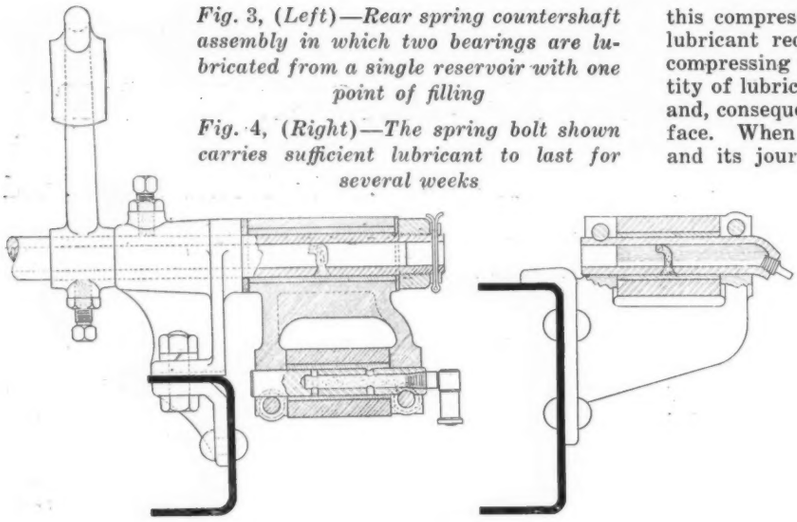


Fig. 3, (Left)—Rear spring countershaft assembly in which two bearings are lubricated from a single reservoir with one point of filling

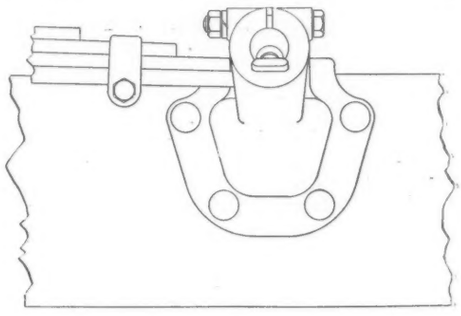


Fig. 4, (Right)—The spring bolt shown carries sufficient lubricant to last for several weeks

engineer of the Lippard-Stewart Motor Car Co., Buffalo, N. Y. The system consists of a wick suspended in a reservoir of oil through a conical shaped hole, which reservoir is formed in the hollow part of a tubular shaft or cast integral with frame brackets, etc. The sharp edge formed at the small diameter of the conical hole acts as a barb that grips the wicks tightly and makes it impossible to pull them out from the outside without destroying them. It holds the wick so firmly that it is quite hard to push it into the reservoir. It is claimed that a wick will stay in position always when once properly applied.

Oil Fed by Capillary Attraction

The oil is fed to the surfaces to be lubricated by means of capillary attraction, yet the amount supplied can be regulated. The point where the sharp edge of the small diameter of the conical hole grips the wick compresses it, and this compression is varied in accordance with the amount of lubricant required for a bearing surface. This method of compressing the wick limits to a reasonable degree the quantity of lubricant that can pass through the wick at that point and, consequently, the amount that can reach the bearing surface. When there is no relative motion between a bearing and its journal, there is no flow of lubricant, as it is the movement of one surface relative to another that causes the oil that has saturated the wick to be wiped off and become distributed over the bearing surface.

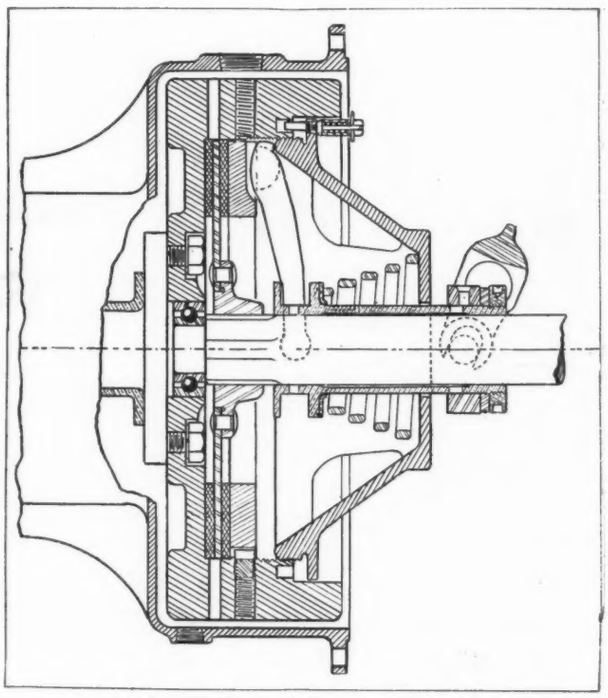
Grease Cups Eliminated

On one model of truck where this lubrication scheme is now used, 18 grease cups are eliminated. These were located under the foot boards. The points at which the lubricant has to be replenished are reduced to 5, and these are all located outside the frame.

Fig. 5 shows the brake countershaft assembly for a truck that does not employ the same scheme for feeding the oil to the bearing as just described, but is interesting in that oil is employed for lubrication. The trunnion bearings shown eliminate any chance of the brake countershaft and tube binding from frame weave when the truck is passing over irregular road surfaces.

Golden, Belknap & Swartz Plate Clutch

A PLATE clutch running in oil has been brought out by the Golden, Belknap & Swartz Co. of Detroit. As shown in the sectional view herewith, the flywheel web forms one of the driving members, the other being constituted by a plate adapted to move endwise on keys secured to the inside of the flywheel rim. Between these driving members ars located the driven steel disk and two rings of wire woven asbestos. The clutch disks are clamped together by three radially disposed double armed levers which are pivoted on the driving ring. Their outer end takes purchase against the inner edge of the clutch cover, and their inner end rests in a groove on the clutch control sleeve which is pressed into the position of engagement by a heavy volute spring inside the clutch cover. The clutch sleeve passes through a central opening in the cover and at its outer end carries a nut against which bears the clutch control collar. The clutch can be adjusted for wear by screwing the cover farther into the flywheel rim and this adjustment can be locked.



Golden, Belknap & Swartz plate clutch

ONE result of the war is likely to be the forcing of Spain into the ranks of producers of ferromanganese. By a recent Anglo-Spanish agreement it was stipulated that Great Britain should supply to Spain ferromanganese to the extent of 120 tons per month, which was shared among the various producers of steel. Deliveries were interrupted by the war, and in consequence some six electrometallurgical companies took steps to produce the article themselves. The companies indicated are the Altos Hornos de Viscaya, the San Francisco del Desierto, the Fabrica de Mieres, the Altos Horno de Malaga, the Fabrica de la Senora Urigoitia in Araya, and the Metalurgica Duro-Felgueta.

Electric Steel Making*

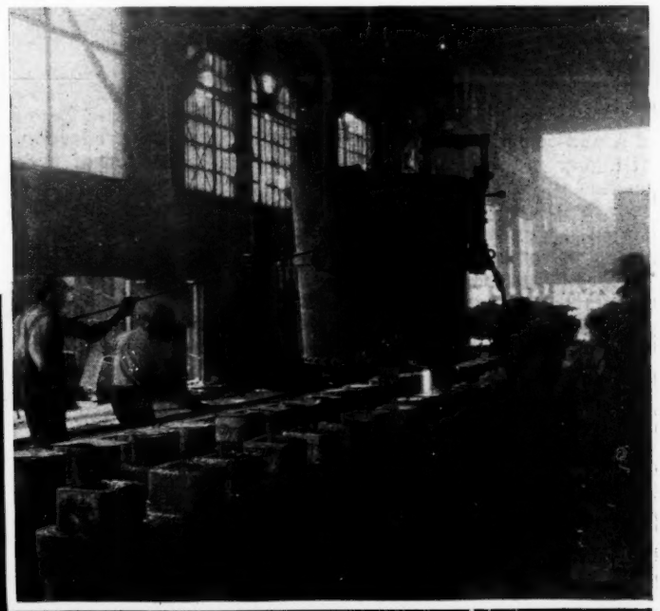
Shutting Off of Foreign Supply Has Developed Industry in America—Production in 1917—Cold Melt and Electrically Refined Steel—Details of the Heroult Process

By Arthur V. Farr

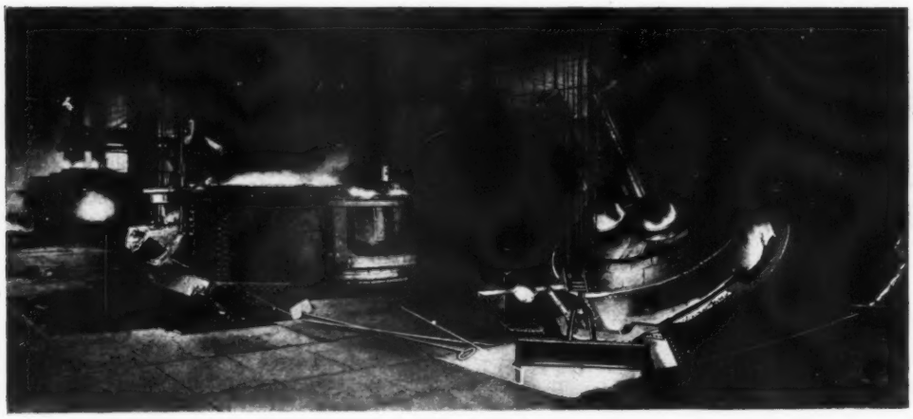
IT would seem that a word of appreciation is due the forging industry of this country for the co-operation extended to the American steel manufacturers, especially apparent since the beginning of the war. The cutting off of the steel supply from abroad made it necessary for American manufacturers to make steel which had previously been imported. The assistance rendered the steel manufacturers by the forging concerns during the first attemtps at making these steels (many of them complicated alloys requiring special manufacturing methods) has proved invaluable.

We believe that this co-operation has reacted favorably on the American forging industry, enabling it to serve most effectively our military requirements, the automotive and allied industries, and to render a service that has prevented any lessening of quality or production. I quote from a report that I wrote less than a year ago, following a visit to a large forging company: "They inform me that they are now getting better steel than they ever got from Germany, better in uniformity and better in physical results after heat treatment. They say that they will never go back to foreign steels." I doubt not but that this experience has been typical of a large number of forging companies during the last three years. Certain it is that the full exchange of ideas, criticisms and suggestions between forger and steel maker has enabled the forger to get a domestic source of supply and

*Paper presented at the fifth annual meeting of the American Drop Forge Association, Buffalo, June 21st, 1918. The author is the sales manager of The Hess Steel Corporation, Baltimore, Md.



"Slagging off." Above: Pouring the ingots



Battery of 6-ton electric furnaces. Samples showing qualities of electric steel

to meet the exacting requirements of the day on a better basis than ever before.

America has been known as a producer of steel in quantity, and it has been but recently that the *quality* element has been emphasized. The continued production of quality steels is making America's reputation symbolic of both quantity and quality.

U. S. Leads in Production

A new-comer in the industry and a factor in the production of higher grade steels is the electric furnace method of production. Starting with 10 electric furnaces in 1910, the growth in the number of installations has been rapid, until May 1, 1918, saw 239 furnaces either in operation or in the course of construction in this country, with a production for 1917 of 235,000 gross tons. The United States has not only maintained its commanding position as a producer of electric steel, but the record of 1917 emphasizes this leadership. The United States and Canada are producing at the present time probably a little less than half of the world's output.

The industry has grown so rapidly and has become so important a factor in the forging industry that it might be advisable to review briefly the method of making electric steel and to call attention to some of the salient qualities of the product of the electric furnace as applied to the forging industry.

Electric steel is made either by melting a cold charge and refining it in the electric furnace, known as "cold melt electric steel," or by refining in the electric furnace the molten charge from the open hearth or Bessemer or a combination of both. This latter method is applicable especially to furnaces of capacity of ten tons and upward, the cold melt method not having proved successful to date in the large units.

Cold Melt Method for Small Units

For units of less than ten tons capacity the cold melt method predominates. This is due largely to the simplification of equipment and the assurance of electric steel quality. Although there is economy in duplex or triplex methods of making electric steel, certain it is that plants equipped exclusively with electric furnaces cannot be accused of merely "washing" the open-hearth steel in the electric furnace. It cannot be gainsaid that satisfactory steel can be produced by the open hearth electric furnace method, provided, of course, that sufficient time is allowed for refining in the electric furnace. Perhaps this point is best illustrated by the present-day attitude taken by some steel purchasers. A request for quotation was sent by a large purchaser of chrome steel and contained the following: "If you are not in position to quote on either electric or crucible steel, we prefer that you disregard the inquiry, as we do not care to consider open-hearth steel or open-hearth with electric furnace refinement." While this attitude cannot be considered as typical, it shows the discrimination that particular purchasers have found necessary to exercise in safeguarding the quality of their product.

The electric furnace, as known in this country, is a metallurgical instrument for the making of steel by means of electric arcs formed between electrodes or between electrodes and the metal bath. It consists essentially of a steel tank lined with refractory materials and fitted with working doors, spout and tilting arrangements for pouring and slagging off. Carbon or graphite electrodes of suitable section are inserted through the roof or sides and are adjustable. A high-tension electrical supply is brought into a transformer house adjoining the furnace and transformed down to about 100 volts for use at the electrodes.

The heat generated by the electric arcs makes possible any desired temperature up to the fusion point of the best refractory materials. The temperature in the furnace is under the control of the operator, and it is changed as the refinement of the steel progresses.

We will describe briefly the method of manufacture of cold melt electric steel in a 6-ton Heroult electric furnace, which is representative of the majority of installations in this country.

Process Divides Into Two Periods

The process of manufacture may be divided into two periods, namely, (1) melting and oxidizing, and (2) recarburizing and reducing.

It appears paradoxical to remove carbon during one period and add it during another, but this is necessary in order to oxidize the phosphorus. Furnaces for reducing phosphorus are lined with basic material, such as magnesite or dolemite. Limestone is charged into the furnace with the scrap. The rust on the scrap furnishes the oxygen, and sometimes ore or roll scale is charged to augment this supply. The slag formed oxidizes the phosphorus which then combines with the lime, forming calcium phosphate. Carbon, silicon, manganese and sulphur are also oxidized to a greater or less extent by this slag.

As an illustration of the furnace reactions that take place the following schedule is given, showing the various stages in the making of a heat of electric steel. The steel to be made was a high carbon chrome steel used for balls for ball bearings.

Furnace, 6-ton Heroult

11.50 a. m. Material charged.
Boiler plate ..... 5980 lb.
Stampings ..... 5991 lb.
——— 11971 lb.
Limestone ..... 700 lb.

12.20 p. m. Completed charging.
(Current switched on.)

3.20 p. m. Charge melted down.
Preliminary analysis under black slag analysis:

C.	Si.	Su.	Ph.	Mn.
.06	.014	.032	.009	.08

3.40 p. m. The oxidizing (black) slag is now poured and skimmed off as clean as possible to prevent rephosphorizing and to permit of adding carbonizing materials. For this purpose carbon is added in the form of powdered coke, ground electrodes or other forms of pure carbon.

Deoxidizing Process

The deoxidizing slag is now formed by additions of lime, coke and fluorspar (and for some analyses ferrosilicon). The slag changes from black to white as the metallic oxides are reduced by these deoxidizing additions, and the reduced metals return to the bath. A good finishing slag is creamy white, porous and viscous. After the slag becomes white some time is necessary for the absorption of the sulphur in the bath by the slag.

The action of desulphurization in the electric furnace is as follows:

After the bath is oxidized as described above the slag acts on the metallic sulphides, eliminating them by forming calcium sulphide, which is taken up by the slag. The desulphurizing actions are illustrated by the following equations:

$$FeS + C + CaO = CaS + Fe + C\,O$$
$$MnS + C + CaO = CaS + Mn + C\,O$$
$$2\,FeS + CaO + Si = 2\,Fe + 2\,CaS + Si\,O_2$$

The white slag disintegrates to a powder when exposed to the atmosphere and has a pronounced odor of acetylene when wet.

Further additions of recarburizing material are made as needed to meet the analysis. The further reactions are shown by the following:

3.40 p. m. Recarburizing material added.
130 lb. ground electrodes,
25 lb. ferromanganese.
Analysis:

C.	Si.	Su.	Ph.	Mn.
0.76	0.011	0.030	0.008	0.26

To form white slag there was added:
225 lb. lime,
75 lb. powdered coke,
55 lb. fluorspar.

4.50 p. m. Analysis:

C.	Si.	Su.	Ph.	Mn.
0.75	0.014	0.012	0.008	0.28

Note the reduction of the sulphur content.

During the white slag period the following alloying additions were made:
500 lb. pig iron,
80 lb. ferrosilicon,
9 lb. ferromanganese,
146 lb. 6 per cent carbon ferrochrome.

The furnace is now rotated forward to an inclined position and the charge poured into the ladle, from which in turn it is poured into molds.

5.40 p. m. Heat poured.
Analysis:

C.	Si.	Su.	Ph.	Mn.	Cr.
0.97	0.25	0.014	0.013	0.33	0.70

Ingot weight poured .... 94 per cent
Scull ..... 2.7 per cent
Loss ..... 3.3 per cent
Total current consumption for the heat, 4700 kilowatt-hours, or 710 kilowatt-hours per ton.

Ingots Cast in Inverted Molds

Electric steel, because of its density, should be cast in inverted molds with refractory hot top to prevent any possibility of pipage in the body of the ingot. In the further processing of the ingot, whether in the rolling mill or forge, special precautions are taken in the heating, in the reduction of the metal and in the cooling.

There is a growing tendency for forging concerns to demand to know the structure of the steel that they are using. This is distinctly a forward step and points the way to accurate heat treatments and more satisfactory results. The demands of high power guns, airplane engines with weight well below three pounds per horsepower, safe, lightweight automobiles, all necessitate the use of the proper kind and weight of steel. These results can only be obtained by the use of properly selected grades. (In line with this tendency, it may be interesting to examine at close range some typical cold melt electric steels. The results indicated are average and such as can be obtained or improved upon in practical experience.)

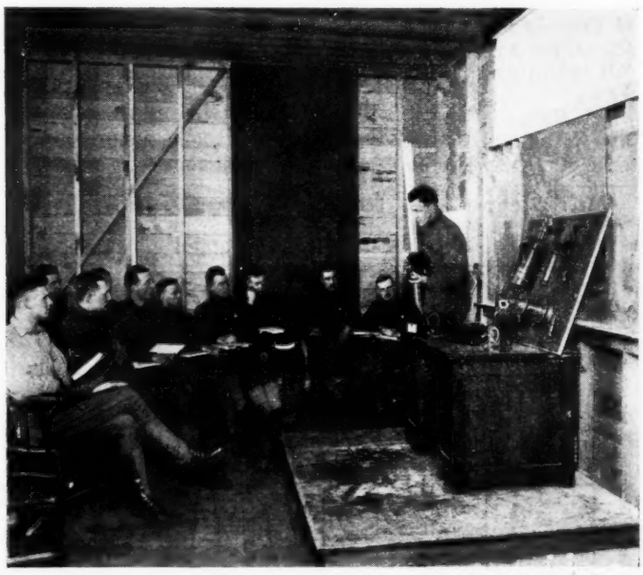
In this paper no attempt has been made to compare at length the relative merits of open hearth and electric steel. I do not believe that is necessary, because results in service, day in and day out, have thoroughly established the superiority of electric steel. Individual laboratory tests do not always square with results in the field, but it is the latter that are wanted. One forger expresses his experience tersely as follows: "We can get physical properties much easier with electric steel." Ten years of experience in this country and in Europe indicate that electric steel in its natural qualities is equal to crucible steel and superior to the steel ordinarily made in the open hearth.

The rare purity of the heat derived from the electric arc, combined with definite control of the slag in a neutral atmosphere, explain in part the superiority of electric steel. Commenting on this recently, Dr. H. M. Howe stated that in the open hearth process you have such atmosphere and slag as you can get, and in the electric you have such atmosphere and slag conditions as you desire.

The ultimate consumer in a large measure is the court of last resort, determining what steels shall be used in the manufacture of his product. It is the ultimate consumer who realizes that the best materials obtainable are none too good, and the drop forger, knowing this and that the difference in cost of steels is small compared with the labor, forging equipment and after expense put upon forgings, finds that it is economy to use high grade electric steel.

The question "What will the forging business be after the war?" is one that the American forging industry is facing to-day. Reports that Germany is exhausted, that her working men are anemic from starvation, that her railroads and manufacturing plants are run down, and that she will be far behind when the commercial race begins after the war, may well be suspected of being a rather coarse form of German propaganda. War, instead of exhausting Germany's industrial and trading potentialities, has actually organized Germany for commerce. The vast majority of the plants that are working to capacity on wartime production can be turned promptly to commercial production. It seems safe to expect that we will have keen competition to face after the war.

Instruction of Aviation Students



Instruction of aviation students in the working principles of magnetos at the University of California's Signal Corps Military Aviation School

How Moisture Affects the Strength of Aircraft Fabrics*

Tests on Cotton, Linen, Balloon Fabric, Tire Fabric and Cords—Variations in Tensile Strength With Differences of Moisture Regain

By G. B. Haven

IT is a well-known fact that cotton and linen are hygroscopic to a marked degree, gathering to themselves automatically a large percentage of their dry weight in the form of moisture. The effect of this "regain" upon the tensile strength is very pronounced. In thick, heavy fabrics such as those used for tires, the strength may be augmented to the extent of 50 per cent or more by the presence of this moisture of regain. In light wing fabric the increase is naturally of less amount, but there is, however, a decided effect in all of these fabrics from this cause.

It is the object of this paper to describe a series of experiments conducted by the author with the able assistance of Mr. Philip O. Yeaton of the Mechanical Engineering staff at the Institute of Technology. All of the work here described was performed in the Textile Testing Laboratory within the last year and forms part of the course of instruction given to detachments of the navy, studying airplanes at the institute.

Description of Fabrics

Five fabrics may be classed under the general title, "Aircraft Fabrics":

(*a*) *Wing Cotton.*—Two classes of cotton wing fabric are advocated by the United States Government bureaus, one woven of two-ply No. 60 yarn and the other of three-ply No. 80 yarn. The weight of these fabrics is from 4 to 4.5 oz. per sq. yd. The yarn is generally mercerized under tension and from 70 to 80 threads per inch of width are employed in both warp and filling. The following tests were made upon the three-ply No. 80 mercerized fabric having a weight of approximately 4 oz. per sq. yd.

(*b*) *Wing Linen.*—The wing linen imported into this country from Ireland, France and Belgium has generally about 94 threads per inch in warp and filling and weighs about 3¾ oz. per sq. yd. It passes from a creamy white color to a dull brown and may be found in grades much heavier than the above.

(*c*) *Balloon Fabric.*—Balloon fabric is made by calendering and vulcanizing thin sheets of para rubber upon fine cotton cloth. One, two or three plies of cloth may be employed.

*Abstract of paper read before the American Society for Testing Materials.

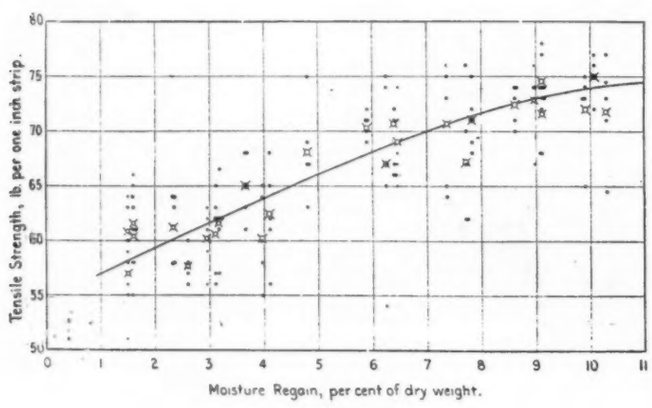


Fig. 1

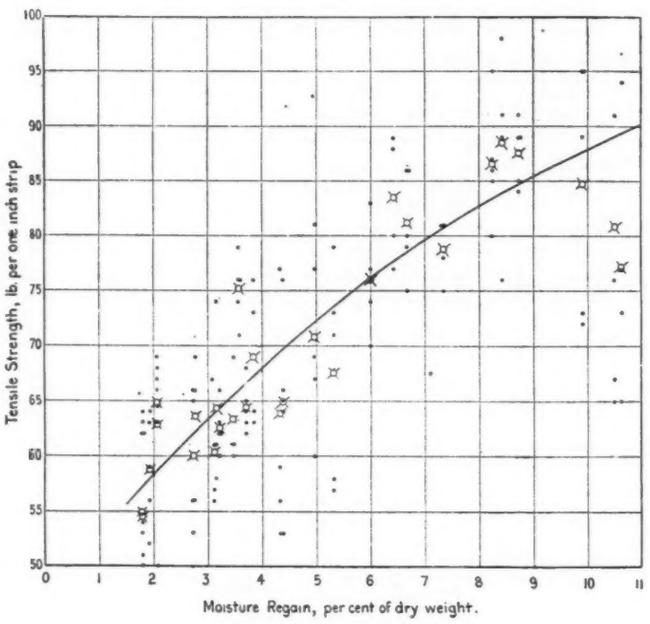


Fig. 2

With two or three plies, the direction of the threads in the fabrics is made to form an angle of 45 deg. with one another in order to localize tears. The cloth count varies from 120 to 160 threads per inch of width in warp and filling. That used in the following tests had quite uniformly 133 threads per inch in warp and filling. The fabric was two-ply with a nominal weight of 11 oz. per sq. yd. Other fabrics of this class range from 4 to 15 oz. per sq. yd. The ply which has its warp threads in the direction of the length of the fabric as rolled is called the "parallel-ply" and the one with its threads at 45 deg. with the roll length, the "bias-ply."

(*d*) *Tire Fabric.*—Woven tire fabric has been widely standardized with 23 threads per inch of width in warp and filling. The threads are made of No. 23 yarn plied eleven times. The weight is generally 17¼ oz. per sq. yd.

(*e*) *Cords.*—Cord tire fabric, or "cords" as it is frequently called, has 23 warp threads per inch of width. These cords are cabled, that is, made up of three strands, and each strand of five primary No. 23 yarns. Thus the warp threads are virtually 15-ply yarns. In order to assemble the warp threads or cords in order, filling threads of single No. 23 yarn are inserted to the number of 2½ per inch. The warp threads are thus loosely held in order until placed in the tire. The weight of this fabric is about 10.1 oz. per sq. yd.

The highest grades of cotton are used in all these fabrics. Sea Island, imported and domestic Egyptian and the better classes of Peeler are generally specified. The cotton is generally combed in process of manufacture.

The facilities of the Institute of Technology for research in this direction are as follows:

(*a*) A testing room of about 5000 cu. ft. capacity, with

heavy concrete walls and floors and tight doors and windows.

(*b*) A Park's humidifying system in the testing room with automatic control. This apparatus will raise the humidity to a set figure and hold it there with but little variation.

(*c*) An Emerson electric conditioning oven with thermostat control. The latter is adjustable to any reasonable figure and has a limit of variation of 2 deg. Fahr. plus and minus. The oven contains eight aluminum weighing baskets carried on turntables. On the oven roof is mounted a pair of fine balances weighing to 0.1 grain. Any basket may be linked to the scale pan and weighed without opening the oven door. The links and baskets are tared by dead weights on the scales so that the net weight of the sample is obtained without subtraction. The oven is thoroughly ventilated while in operation.

(*d*) Three Scott testing machines were employed, having capacities ranging from 50 to 800 lb. The clamp jaws were of the flat-hinged type wider in all cases than the strip of fabric under test. The distance from the machines to the oven door was 3, 6 and 8 ft. respectively. The speed of the testing machine jaws was 12 in. per minute in all cases.

(*e*) *Balances.*—All the weighings for the plots were made on Becker Analytical balances to 0.01 grain. Great care was expended in securing the last significant figure in the weighings.

(*f*) *Weighing Bottles.*—In order to hold specimens at stable humidity while weighing, bottles of thin glass with airtight ground-glass stoppers were employed. Their capacity was 40 cc. and they easily accommodated four or five of the strips to be tested.

(*g*) *Wet Room.*—Where extremely high humidity regains were desired, recourse was had to a room without windows in the basement of the institute. This room is kept continually as near 100 per cent relative humidity as possible by an American humidifier. In the exposures made in these tests the apparatus was shut down to avoid spray until the relative humidity was not over 95 per cent. The specimens were hung 6 ft. away from and 2 ft. above the level of the humidifier.

In addition to the above, the usual complement of cutting, counting and measuring apparatus was available. All the specimens were accurately measured off in width by means of a Lowinson thread micrometer over an illuminated field of ground glass.

Specimens

All the specimens were cut to the definite length and width given in Table I.

TABLE 1—DIMENSIONS OF SPECIMENS

Kind of Fabric	Specimen: Length, in.	Specimen: Width, in.	Raveled to	Distance Between Jaws, in.
Wing cotton	7	1¼	1 in.	3
Wing linen	7	1¼	1 in.	3
Balloon	6	1½	Not raveled	3
Woven tire	7	1½	23 threads	3
Cords	16	One cord	.....	10

Preliminary tests developed the following facts:

1—The duration of heat in the oven effects the tensile strength of balloon fabric and woven tire fabric as shown in Table II.

TABLE 2—EFFECT OF HEAT ON TENSILE STRENGTH OF COTTON FABRICS; OVEN TEMPERATURE 220-230° F.

Time in Oven, hr.	Average Tensile Strength, lb.: Woven Tire Fabric	Average Tensile Strength, lb.: Two-Ply Balloon Fabric
2	186.6	75.5
3	187.6	72.8
4	182.2	72.8
5	185.8	69.5
6	185.6	74.8
7	190.2	72.5
8	188.2	73.8
9	184.4	72.5
10	181.8	...
11	190.4	...
12	187.0	...
13	186.0	...
14	185.0	...

2—The average tensile strength of conditioned samples of woven tire fabric was 287.4 lb. as compared with 289.4 lb. for dried and reconditioned samples.

3—The average tensile strength of samples of Courtrai wing linen after conditioning 3 hr. was 99 lb. while the average tensile strength of samples dried 3 hr. in the oven was 67.3 lb.; samples dried 3 hr. and then reconditioned for 3½ hr. showed average tensile strength of 99 lb. with a moisture

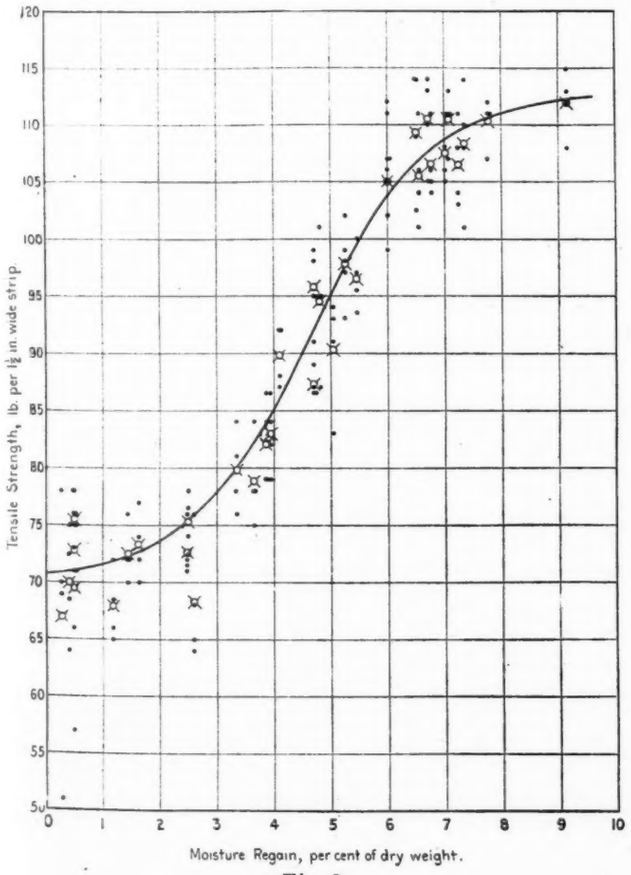


Fig. 3

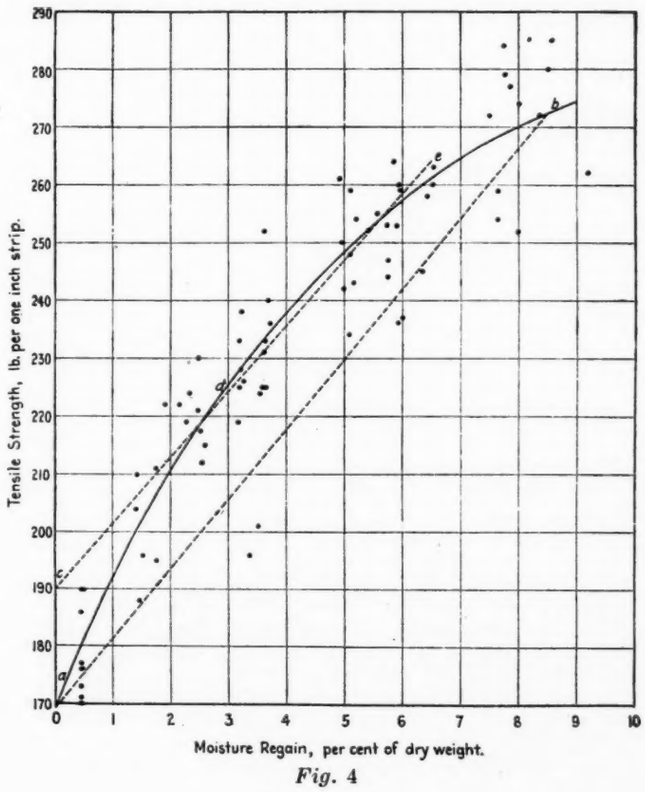


Fig. 4

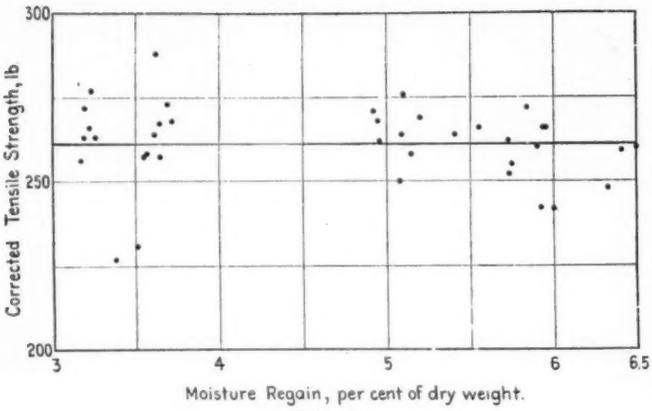


Fig. 5

regain of 7.94 per cent or 6 per cent increase in strength for each per cent of moisture absorption.

4—Dried and reconditioned samples of balloon fabric showed an average tensile strength of 101 lb. against 105.6 lb. for conditioned samples.

5—The effects of joints in balloon fabrics on tensile strength are as shown in Table III.

TABLE 3—TESTS OF JOINTS IN BALLOON FABRIC

How Tested	Average Strength, lb. Light	Medium	Heavy
With joint	90.8	100.4	103.6
Without joint	94.8	97.0	103.8

Methods

The humidity in the testing room was run up to a high figure. For most of the tests the temperature was 75 deg. Fahr. and the relative humidity 80 per cent. The samples of a given fabric were hung all at one time to the number of about 150 in the room and allowed to regain moisture for not less than 4 hr. They were then taken in groups of four or five and held in a hot oven for periods varying from 3 sec. to 20 min.

This operation graded the actual regain from a high figure practically to bone dryness. After removal from the oven the samples were placed between the leaves of a heavy book to keep the moisture as near stationary as possible until they were tested. They were broken in rapid succession, removed speedily from the machine and immediately inclosed in air-tight glass weighing bottles. The interval between breakage and sealing in the bottles was not over 4 sec. Five samples of the linen and cotton were grouped as one test and weighed after breakage together. It was assumed that their humidities were all the same. For the balloon fabric four samples were grouped. Immediately after breakage the bottles and contents were weighed and the net weight of the fabric found by subtraction. The fabric was next taken from the weighing bottles and dried for not less than 2 hr. in the oven. The fabric was transferred from the oven baskets back to the weighing bottles inside the oven door by means of tweezers. No specimens were touched by the hands except a few of the balloon fabric. After cooling, the bottles were again weighed and the bone dry weight of the contents found by subtraction. From this the regains at the actual time of the tests were calculated in terms of the dry weight. It is believed that this mehtod is as accurate as can be found for determining the moisture actually present at the time of breakage. For higher degrees of regain the samples were hung from 10 min. to 2 hr. in the wet room previously described where the relative humidity was about 95 per cent.

In the case of the woven tire fabric only one sample at a time was tested. This was first dried, then exposed to moisture in the wet room and lastly tested as above.

The results of the tests upon cotton wing, linen wing, balloon and woven tire fabrics are shown in Figs. 1, 2, 3 and 4, respectively. Their interpretation is evident. The several tests at a given humidity are denoted and their average is signified by the crossed circle.

It was found that it was very difficult in this thin fabric to test the samples, nominally "bone-dry," without a considerable reabsorption of moisture. About 1.5 per cent regain occurred during the interval between removal from the oven and breakage. "Full regain" in an atmosphere slightly above standard was denoted by about 8 per cent absorption. Beyond this the absorption was obtained by exposure in the wet room at 95 per cent relative humidity. The average increase in strength from the dryest obtainable to 8 per cent regain was from 58 to 72 lb., or 14 lb., about 24 per cent of the bone-dry strength. This corresponds to about 3 per cent increase in strength for each added per cent of moisture. Twenty-four sets of tests made by the classes in airplane study at the institute upon this same kind of fabric showed an average increase of 26 per cent between bone dryness and full regain. The curvature of the plot does not take place within the region of usual regain and the line may be considered straight for all practical purposes. One hundred and thirty-three samples were broken in this fabric and only two were cast out as indicating "flaw breaks."

Wing Linen

The normal regain of raw flax fiber is often stated as 12.5 per cent of the dry weight. While this is doubtless true for a free condition of the material, the figures are much less for manufactured linen. Flax absorbs moisture much more quickly than cotton. Bone-dry samples tested with great dispatch regained nearly 2 per cent of moisture before breakage. The normal regain for the fabric was about 9 per cent and the strength increase from about 55 lb. to 85 lb., or 30 lb. This represents about 54 per cent of the bone dry strength, a gain of 6 per cent in strength for each added per cent of moisture. Twenty-two sets of tests made by classes in aviation showed 40 per cent increase in strength. The degree of moisture regain in these tests was not so high as those performed by the author. One hundred and twenty-three tests were made on linen and five omitted in the plot. A few were made at yet higher degrees of moisture and indicated but little increase in strength, hence the line should bend down to the horizontal as it leaves the plot.

Balloon Fabric

The effect of moisture on rubberized fabrics is unique. The moisture is very much slower naturally in entering such material. Bone-dry tests can be conducted with an actual moisture reabsorption of less than 0.5 per cent before breakage. At low regains the moisture probably lies upon the outer surface and has but little effect upon the strength. At higher regains the moisture evidently penetrates the fiber and has a pronounced effect. From bone dryness to a full regain of 7½ per cent there is an increse of from 70 to 110 lb., or 40 lb. This corresponds to about 57 per cent of the dry strength, or nearly 8 per cent increase for each added per cent of moisture. The increase is not uniform, however, as the curve indicates. One hundred and thirty-nine breaks were made and none omitted on the plot.

Woven Tire Fabric

The term "standard regain" has generally been applied to the percentage of moisture automatically absorbed by raw cotton when exposed for a more or less lengthy period in an atmosphere at a temperature of 70 deg. Fahr., and a humidity 65 per cent of saturation. This quality has generally been stated as 8.5 per cent of the dry weight. While the above regain value is doubtless true for raw cotton exposed for long periods to high degrees of moisture, it is believed that for heavy grades of manufactured cotton, where free access to the air is less perfect and especially where the regain is artificially produced by exposure of but a few hours in a "conditioning room," the value seldom exceeds 6.5 per cent of the dry weight. It is therefore proposed from practical considerations, to define the "standard condition" of tire fabric as that at which a moisture regain of 6.5 per cent of the dry weight has been attained. Fig. 4 was the work of Messrs. Yeaton and Panettiere, performed under the author's direction in the Textile Laboratory at the Massachusetts Institute of Technology, and comprised accurate strength and regain determinations with the latter varying from zero to 9

(*Continued on page* 108)

Recovery of Gasoline from Natural Gas

Machines Used in Plants of Standard Design—Industry About Fifteen Years Old and Growing Rapidly

IN investigating the general problems that relate to the petroleum industry of the United States, the Bureau of Mines has given considerable attention to the recovery of motive fuel from natural gas. Recent developments in gasoline power units and their increasing use have made it imperative that all fractions of petroleum, suitable for fuel in this type of engine, be conserved. The Bureau has issued a number of publications on this subject, the latest being Bulletin 151, on The Recovery of Gasoline from Natural Gas by Compression and Refrigeration, by W. P. Dykema. It treats of the compression and refrigeration process for the recovery of gasoline from natural gas from the viewpoint of the practical engineer and business man. Conditions of actual operation and the equipment in use are cited and described, so that operators and others interested can compare the variations and methods of treating natural gas for its gasoline contents, in the different fields, and also the conditions encountered, and the features that control the methods used.

The bulletin deals with the subject quite extensively, in more than a hundred pages of text and illustrations. It may be of interest here to reproduce the conclusions reached by the author.

Raw Materials Affect Methods Used

The various hydrocarbons, and also the impurities, found in natural gas as it comes from oil or gas wells, have a direct bearing on the plant practice and treatment that will yield the most condensate. The more complete and thorough the tests made on the gas to determine its composition and physical characteristics are, the less chance there will be of those interested building and operating a compression plant that is not best suited for treatment of that particular gas.

Thus far the plants installed have been generally of standard design and equipment using the maximum safe pressures for which standard machines and fittings were built and temperatures obtainable by simple methods of water cooling, little consideration being given to the qualities of the gas to be treated.

Gas testing as followed at the present time is done only to determine if the gas can be profitably treated, and, if found so, a plant of general standard design is put in operation. It must be admitted that these plants as a whole, throughout the United States, have proved financially successful, but as a rule such success is due, in the writer's opinion, more to the fact that only the rich gas has been taken for treatment than to careful plant design and operation. The great increase in production at a few of the plants where the operators have studied the gas being treated and installed equipment best suited to its composition and characteristics indicates that gross waste is taking place at many plants of standard design. As more is learned of the best methods of treating natural gas in compression plants, gas of lower gasoline content can be and will be used in such plants.

Treatment Should Change with Aging of Wells

At many plants visited no gas tests of any kind had been made since the original tests to determine whether the gas was rich enough in gasoline to warrant treatment. With the aging of the wells, the extension of gathering lines, and the installation of vacuum pumps, which often draw air into the gas lines, it is hard to believe that no variation in treatment was necessary if the best results were desired. Gravity tests of the gas used should be made from time to time at all plants. The results will indicate any changes in composition and usually whether air has been taken into the line. This test, if made at different points in the treatment and on the treated gas may also indicate either a change in the character of the gas or that some part of the plant is not working as usual. Other tests, such as absorption and compression tests and analyses, made and recorded at regular intervals, have been of value in determining sources of trouble and indicating the need of experiments and of plant changes.

Experimenting with the entire plant or one complete unit by changing the temperatures and pressures and recording the results may lead to better recovery or a better product.

Pressures and Temperatures

Gas from wells that are being and often have been gas-pumped for years, and are held under high vacuums is composed largely of the heavier vapors that would, unless vacuums were used, remain as liquid in the oil, and in treating such gas extreme pressures and temperatures are not necessary.

In eastern fields, where these conditions are most often found, single-stage plants working at a pressure of about 100 pounds and using such temperatures as can be obtained in submerged coils cooled by the natural temperatures of well or creek waters, give satisfactory recoveries and produce condensates with a gravity and vapor pressure as high as can be handled, either blended or unblended. In the same fields, however, plants treating gas from old wells not held under vacuum have found that not enough of the vapor carried by the gas can be condensed at pressures lower than 300 pounds to be profitable. The condensate produced at that pressure was exceedingly wild and in order to effect a maximum saving required blending as early in the process of precipitation as possible. It appears from the above facts that gas taken from wells held under high vacuum carries portions of the higher-boiling fractions, distilled from the oil under reduced pressures, that would otherwise have remained in the oil in the sands. The removal of the lighter fractions by this method has less effect on the gravity of the refined oil than would at first seem probable, because a marked percentage of these vapors undoubtedly came from oil left in the sands which in all probability will never be extracted, and also because the oil production from many small wells held under high vacuums is stored for days, and even weeks, in tanks, exposed to changes in atmospheric temperature, during which time the lighter fractions are lost to a greater or less extent. Under these conditions, relieving the oil of its lightest vapors before it is exposed to evaporation, or while still in the sands underground, would save these valuable products.

Practice in Newer Fields

In the newer fields, in which the gas is still produced under widely varying rock pressures, a maximum plant pressure of 250 pounds is almost universally used, and refrigeration has often been found to increase production 10 to 50 per cent.

Besides the usual cooling with water, at some plants the gas is also cooled in heat interchangers, while still at the maximum pressures used, with expanded gas. The dry compressed gas is expanded adiabatically in the power cylinder of a steam engine, its temperature being lowered at times to — 100° F. In the heat interchanger the high-pressure gas is reduced to temperatures as low as — 10° F., which causes vapors not condensed in the water-cooled system to precipitate. It is the writer's opinion that many plant operators are overlooking gas expansion as a means of increasing the net production of their plants.

The treatment of natural gas for gasoline is unlike those

manufacturing processes in which the treated material may be stored and treated a second or third time after the first extraction or concentration of the desired portions, because the gas, after once coming to the surface, must be kept moving until treated and used as fuel or wasted to the atmosphere. Thus marketable fractions of condensate left in the gas after treatment are practically entirely wasted.

Condensate

The gasoline carried in natural gas and precipitated at different points in the treatment consists mostly of pentane and hexane, the fifth and the sixth members of the paraffin series, smaller proportions of heptane, the seventh member, and decreasing percentages, if any, of propane and butane, the third and fourth fractions. In condensates produced at high pressures and low temperatures, probably some propane and butane are present and with dissolved gas cause the high vapor tensions of some plant products. The amount of dissolved gas is probably of no importance, as far as volume is concerned, but there seems to be little reason to doubt that when the pressure on the condensate is relieved the gas has a decided tendency to cause boiling and agitation of the liquid, which, with boiling of the propane or the butane, causes losses not only of these constituents but also of some of the heavier members during weathering.

The gravity of the plant products as they come to the accumulator or the "make tanks" varies between 70° and 96° B., and the vapor tension, from 5 to 40 pounds.

The gravity and the vapor tension of the condensates as collected in the accumulator tanks of the successive stages become higher as the higher pressure and the lower temperature changes are reached. The products range from line drip or distillate with a gravity of 55° B., produced at atmospheric temperature and pressure, to condensate with a gravity of 105° B., produced in the accumulator tank at the expansion-engine exhaust, at — 40° F., the gas having been reduced to a pressure of 10 pounds.

Experiments and the equipment of recent plants indicate that to remove the condensate from contact with the gas as soon as possible after precipitation and collection is the best practice. This is accomplished by the use of small automatic traps, which drain the liquid from the accumulator tanks as soon as collected. The liquid then passes through pipes to "make tanks," or storage tanks, the pressure being reduced on a small quantity of condensate at each dumping of the trap with the least possible agitation and consequent boiling. This method reduces transfer losses and those from sudden lowering of pressure on large amounts of condensate at one time. The automatic traps are used in transferring either raw or blended products from accumulator tanks to storage or "make" tanks at lower pressures.

Blending

Although some casing-head gasoline is shipped and used without being blended, most of it is mixed or blended with naphtha of lower gravity and vapor tension before reaching the consumer.

Condensate, although at times shipped unblended, is in the most modern plants and the latest practice blended as soon as possible after being formed, or even while in the process of precipitation. Some operators still ship their product partly blended or reduced in gravity and vapor tension to blending stations or refineries, but the general practice is to blend at some stage of precipitation or storage at the plant.

Blending at the plants is done in the storage tanks, the "make tanks," and the accumulator tanks, and at times in the coils while the condensate is still in process of precipitation and in contact with the high-pressure gas. Operators using these methods claim definite increases in production for each successively earlier point in the process of cooling and precipitation in the high-pressure units at which blending is accomplished.

Naphthas having an end point of approximately 400° F. are in general use as blending stocks, but at some plants where regular supplies of this stock could not be obtained, distillates having the end points and gravities of kerosene are used.

Some blending companies use with the usual naphthas small quantities of "straight" still-run California gasoline, specific gravity 58° B., and Mid-Continent and eastern grades, specific gravity 66° to 68° B., in order to increase the proportions of those hydrocarbons of which the naphtha and the condensate contain only small percentages.

The Advancement of the Industry

Since the first commercial gas compression plants were established, about 15 years ago, in the eastern oil fields, marked advancement has been made in the mechanical and commercial phases of the natural gas-gasoline industry.

Up to about five or six years ago most of the plants consisted of the simplest forms of gas pumps, single-stage compressors, and cooling coils, were operated only on rich casing-head gas that would produce 4 to 6 gallons of condensate, and had a capacity of not more than 200,000 or 300,000 cubic feet daily.

At present plants are in operation treating 6,000,000 to 9,000,000 cubic feet daily of gas yielding as low as 1 gallon of condensate per 1000 cubic feet, using pressures of 250 and 300 pounds per square inch in two stages of compression, with elaborate systems of cooling the gas with water before compression and after each stage of compression. The water used is cooled below normal temperatures by induced aeration and radiation.

In some plants the gas is further cooled by expanding the dry treated gas through the cylinders of an expansion engine and using the cold expanded gas to cool the high-pressure gas from the water-cooled coils. Temperatures as low as 0° F. are often obtained, causing the precipitation of nearly all the condensable fractions commercially valuable for making gasoline.

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Definition of Hardness

IN France a method of testing hardness has been in use for sixty years or more which consists in dropping from a given height onto the material to be tested a small hammer or "monkey" with a pyramidal or conical point which causes an indentation of the material. Originally the reciprocal of the width of the indentation was taken as a measure of the hardness. In 1895 Lt.-Col. Martel in a paper presented to the Paris Congress on Testing Materials showed conclusively that the work expended in making the indentation is proportional to the volume of the indentation, irrespective of the form of the hammer point. If V is the volume of the indentation, P the weight of the monkey and F the height of fall, then $D = PF/V$ is the Martel hardness number. It has now been shown by W. C. Unwin in an article in *Engineering* that the Martel hardness numbers are identical with the Brinell hardness numbers. In the Brinell test the standard ball is 10 mm. in diameter and the load 3000 kg. If P is the load and A the area of the spherical surface of the indentation then Brinell's hardness number is $H = P/A$ in kilogram-millimeter units.

Unwin states that the reason for dividing P by the surface of the spherical calotte is not obvious, and it is not known that Brinell has given an explanation. He then proceeds to show mathematically that the Brinell number is identical with the Martel number and that hardness of a ductile material may be defined as (a) the work required to indent unit volume or (b) the ratio of a steady load to the spherical surface of a ball indentation.

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MOTOR tractors are now being used to expedite farm work on a rubber plantation of some 20,000 acres in Sumatra, which is controlled by one of the largest tire manufacturing companies in the United States, says the *Commercial Motor*. Before the tractor was put into service it required 250 coolies to plough three acres a day; the tractor at present in use is cultivating 20 acres of land in the same time.

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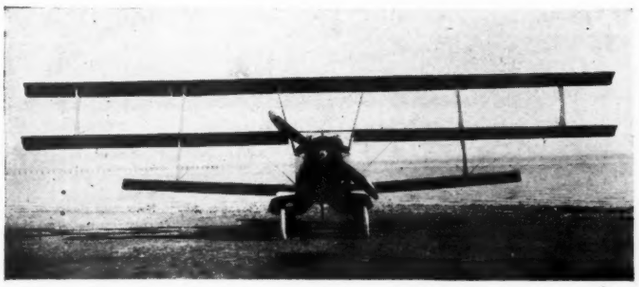
IN the key to the illustration which accompanied our recent article on the Gasograph, there occurred a number of errors. Fig. 2 indicated the compensating thermostatic arm, instead of the movement (though this arm is a part of the movement); Fig. 5 represented the gasoline level and not a pressure piston. We believe that with these corrections the operation of the device will be perfectly plain from the description.

Representative Types of American Airplanes

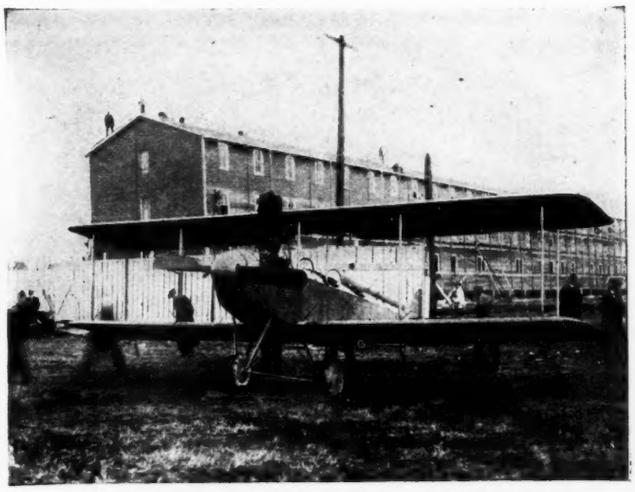


Curtiss model L triplane

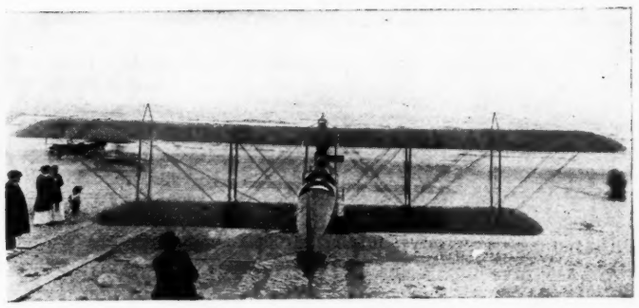
L-W-F with Sturtevant engine

Curtiss Twin JN

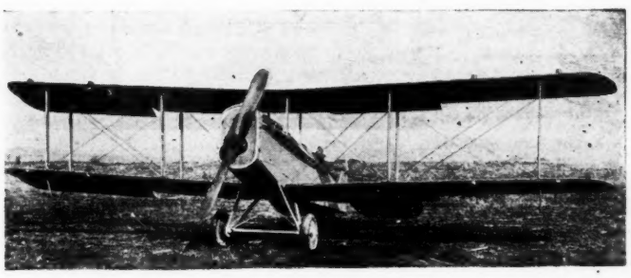
Martin training plane



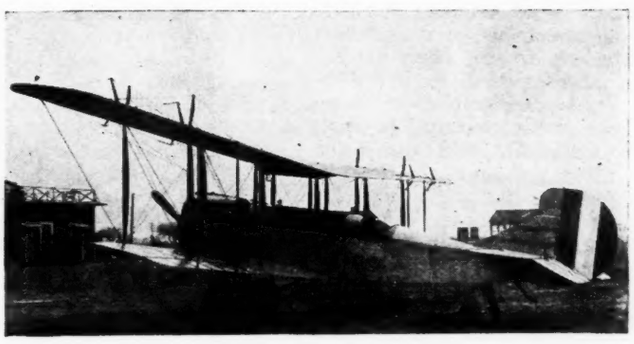
Standard school machine



Standard J training plane

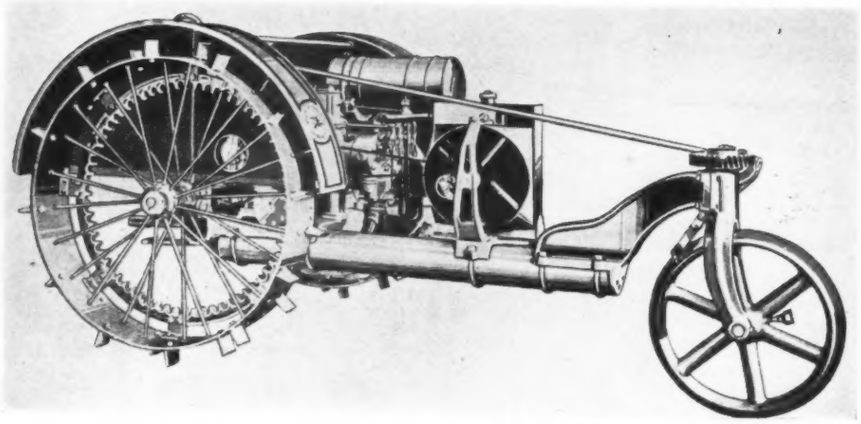


The Liberty DH4



Curtiss mail machine

Larger Engine in Happy Farmer Tractor



Side view of the Happy Farmer tractor

New Model Superseding Others Also Has New Oiling System and Longer Frame—Turning Radius Has Been Shortened

ALL of the principal features of its previous models have been retained in the new model F Happy Farmer Tractor which has been brought out by the La Crosse Tractor Co. of La Crosse, Wis. The three-wheel construction, light weight, short turning radius and low center of gravity which characterized its forerunners are also found in the new model.

The changes which have been made include an increase in the bore of the cylinders to 6 in. and a lengthening of the pipe member of the frame which increases the length over all to 153 in. and gives a better balance to the tractor. To facilitate starting, a gasoline primer has been installed and the change from gasoline to kerosene is accomplished by means of a device which is practically automatic in operation.

Another new feature is an improved oiling system in which the lubricating oil is used three times and which makes it unnecessary ever to drain the crankcase. There has also been added a new centrifugal air cleaner of unusual design.

An engine of the twin horizontal, valve-in-head type of the company's own design is employed. It has a bore of 6 in. and a stroke of 7 in. The cylinders are cast in block. The engine has a normal speed of 750 r.p.m.

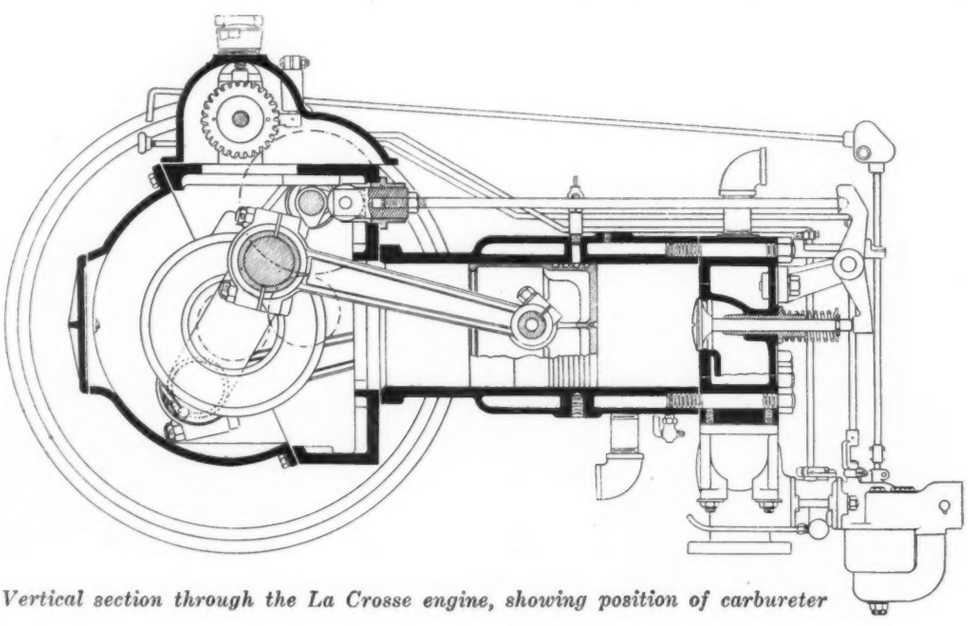
As will be seen from the drawings and photographs herewith the valves which are 2⅝ in. in diameter are operated by means of rocker arms of exceptionally substantial design which are actuated by long horizontal push rods extending from the camshaft inclosure which is located in the upper portion of the crankcase.

The short intake manifold is surrounded by the exhaust as a means of providing the necessary heat for the thorough vaporization of kerosene when that fuel is being used which is, of course, the major portion of the time, as gasoline is used only for starting purposes. The carbureter is a 1½-in. Kingston. The timing of the intake valve is such that a considerable vacuum is created in the combustion chamber before the valve is opened. This has the effect of causing the vaporized kerosene to rush into the combustion chamber at high speed, and this reduces materially the time during which condensation can take place. The temperature of the mixture as it enters the combustion chamber is said to be from 40 to 50 deg. higher than that of the atmosphere.

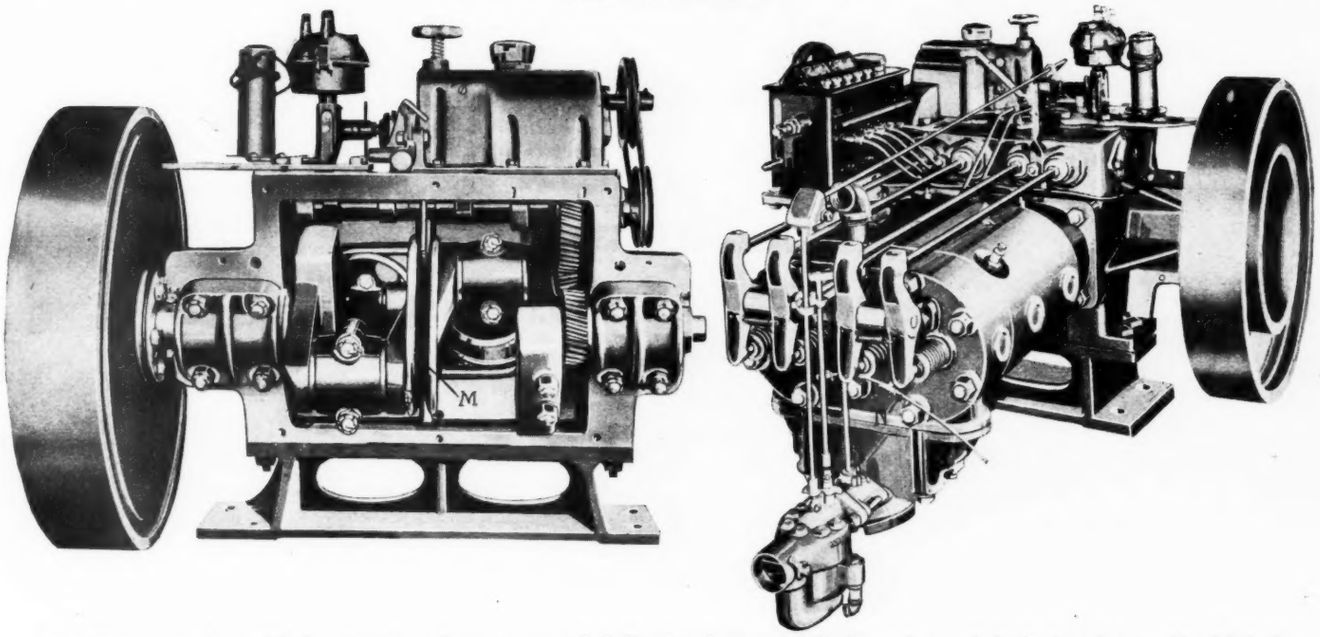
The design of the removable cylinder heads provides for an ample jacketting about the valves. The combustion space is cylindrical in shape. The pistons are of the square type with four rings at the top and the piston pins are located centrally along their length. The latter turn in the pistons and are secured in the small end of the connecting-rods by means of clamping cap screws which fit within slots cut in the pins.

The crankshaft is drop forged, 2½ in. in diameter and has two main bearings 5½ in. long. The connecting-rods are 2½ in. by 3½ in. at the point of largest section and are 13 in. long between centers. The bearings are die cast with babbitt backed with bronze bushings.

A system of forced-feed lubrication is used employing a Madison-Kip five-lead oiler, which is driven by a belt. An original feature of the lubricating system is the use of a pressed steel oil ring centered on the crankshaft midway between the two bearings. This ring resembles two eccentric concave disks joined together. It is fitted with a double



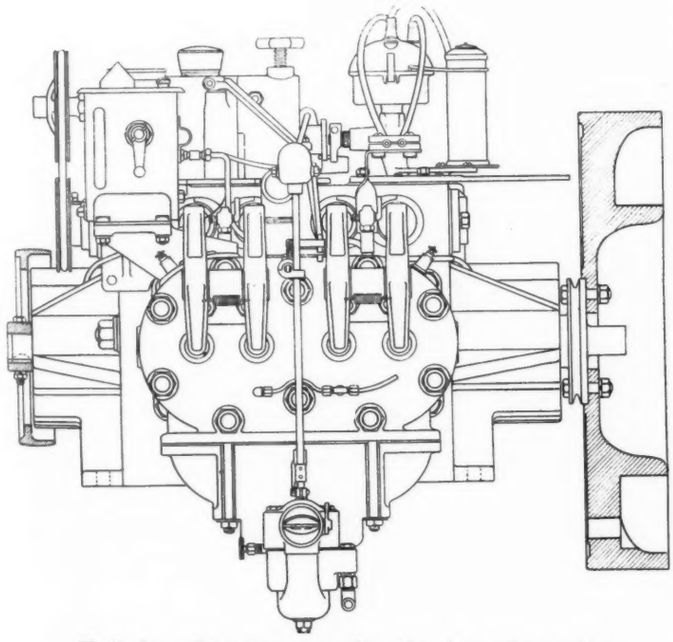
Vertical section through the La Crosse engine, showing position of carbureter



La Crosse engine with front of crankcase removed, left, showing crankshaft and crankshaft bearings. M—Disk for patent oiling device. At the right is the front of the engine, showing the arrangement of the valves. N is the pipe for gasoline jet for starting

flange at its periphery. As the oil is fed to this ring in a jet from the Madison-Kip oiler the eccentricity of the disks throws it from one side to the other. It is caught at the periphery and is fed by centrifugal force to the center of the main crankshaft bearings through holes drilled in the crankshaft.

As the oil runs from the main bearings it is caught in a sump at the bottom of the crankcase. Provision is made in the form of baffle plates to prevent any kerosene which may have worked by the piston rings from getting into this oil which is drained to the gear cases and from there conveyed mechanically to the final roller driving pinions. In this way the oil is used three times and at no time can it be mixed with kerosene. It can also be seen that this system makes it unnecessary ever to drain the oil out of the crankcase, as that matter is taken care of automatically.



End view of La Crosse engine, showing valve rockers and ignition equipment

The cooling system comprises a Spirex Modine radiator, fan and circulating pump. The radiator is mounted lengthwise on the main tubular member of the frame well toward the front. The construction of the cylinders is such that there is a circulation of water between them and around the valves in the head. The cooling system has a capacity of 9 gal. The fan runs at a speed of 2100 r.p.m. A belt tightener is provided to insure that this speed is always maintained.

A contracting band clutch of the company's design is used. The gearset is of the sliding type and runs on Hyatt bearings in oil. In the differential the ring gear is not integral with the spider but is bolted on and is made of semi-steel. As is shown in one of the photographs, a differential brake is provided to assist in making short turns. In the drawings of the differential the method of lubrication for both the differential and the final roller drive pinions is shown. In the front sectional elevation view the pipe through which the oil runs from the motor crankcase is shown as are also the pipes which conduct the oil on the final stage of its journey from the troughs at the top of the differential case to the roller pinions.

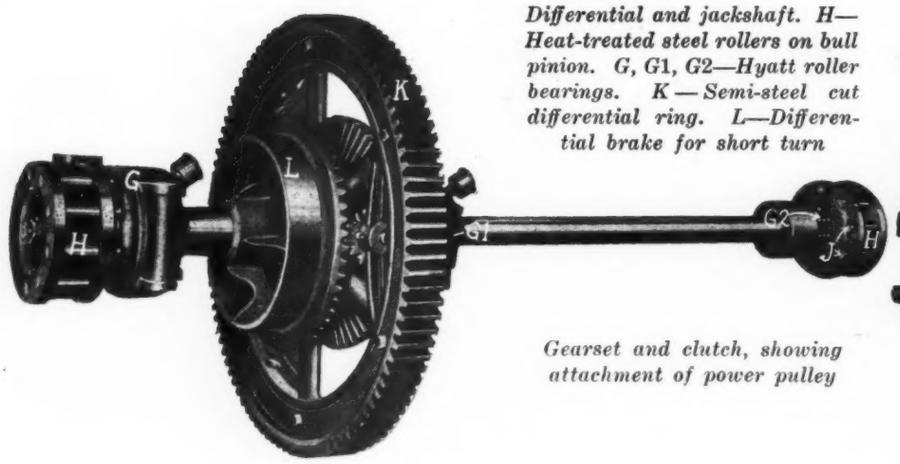
The open bull pinions on the ends of the jackshaft are fitted with ¾-in. heat-treated steel rollers and mesh with the internal bull gears on the driving wheels to provide the final drive. A gear ratio of 42 to 1 is used. The bull gear is made of cast semi-steel in four segments which are interchangeable. They are attached to the wheels by ⅝-in. bolts which are made a driving fit in order to prevent their working loose.

The bull gears are not inclosed but the pinions are provided with mud guards for protection and adequate lubrication is provided in the manner previously described.

The front portion of the frame is made up of a large diameter pipe supporting a cast bracket which carries the steering wheel yoke. A worm engages with a worm wheel secured to the steering wheel yoke and through this combination by means of a hand wheel the tractor is steered. The right drive wheel and the steering wheel run in the furrough when plowing, and steering is therefore said to be practically automatic.

One of the special features of the Happy Farmer Tractor is the centrifugal air cleaner used. It is a cylindrical dipper shape device mounted against the front of the radiator with its large open end opposite the hub of the fan and held there by means of a spiral spring. The theory of operation is that the centrifugal action set up by the fan will throw dirt and dust away from its center leaving clean air to be drawn in through the cleaner and its connecting pipe to the carbureter.

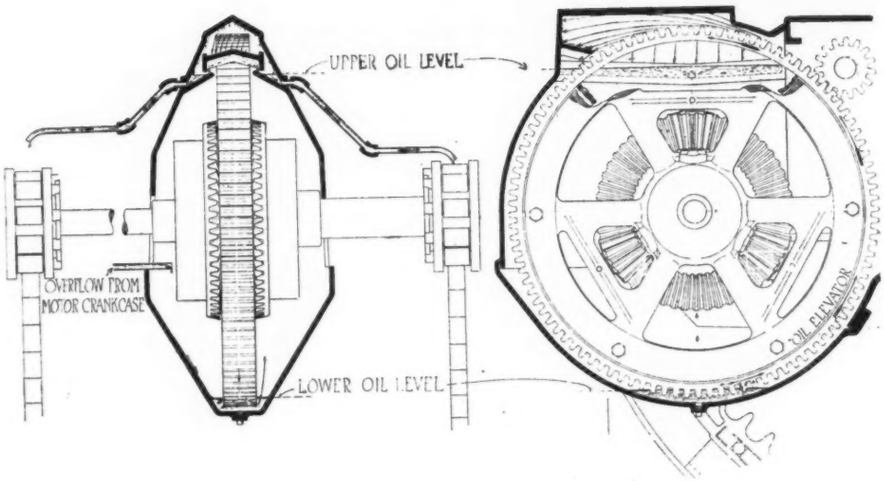
The weight of the tractor is 3800 lb., 88 per cent of the weight being distributed on the drive wheels and 12 per cent



Differential and jackshaft. H—Heat-treated steel rollers on bull pinion. G, G1, G2—Hyatt roller bearings. K—Semi-steel cut differential ring. L—Differential brake for short turn

Gearset and clutch, showing attachment of power pulley

on the front steering wheel. It is rated at 12-24 hp. and is said to have a pull of 2000 lb. at a normal speed of 2½ m.p.h. The turning radius is 8½ ft. and by means of the differential brake referred to the tractor can be turned about practically pivoting on either driving wheel. The draw bar is of the swinging type, attached midway between the drive-wheels 16 in. from the ground, has a lateral adjustment of 30 in. and a vertical adjustment of 3 in. The tractor sells for $1,075 f.o.b. La Crosse. The production for the current year is to be about 4000.



Right—The new Happy Farmer patent oiling system

How Moisture Affects the Strength of Aircraft Fabrics

(*Continued from page* 102)

per cent. Seventy-five warp specimens were broken and none have been cast out.

The actual increase in tensile strength with moisture regain between bone dry and 8.5 per cent is indicated by the curved line *a b*. This is not a very abrupt curve, but approximates somewhat the straight dotted line *a b*. For the dotted line *a b* the rate of increase in tensile strength is 7 per cent for each added per cent of moisture for the fabric. This has led some testing laboratories to adopt a method of correction for moisture regain. The samples are weighed in their natural condition and broken in rapid succession before the moisture present can change. The broken specimens are then weighed again after drying in an oven. This gives a means of computing the regain which was present at the actual time of testing. To reduce the tensile strength to a condition of complete moisture regain, namely 8.5 per cent, it would be necessary first to divide the apparent strength by 100+ (7 × actual regain percentage at test), and then multiply by 100+ (7 × 8.5). This is equivalent to reducing the strength of the sample to a bone-dry condition, on the assumption of 7 per cent strength increase for each per cent of regain, and then moving it up again on the same basis to a full regain of 8.5 per cent. Thus, if a piece of tire fabric gives an apparent tensile strength of 260 lb. and was found to contain 4 per cent regain at the time, its strength corrected for full regain would be,

$$\text{Corrected Tensile Strength} = \frac{260 \times [100\ (7 \times 8.5)]}{100 + (7 \times 4)} = 324 \text{ lb.}$$

If tire fabric could be made to move readily from the bone-dry condition to full regain, the above method would suffice and give results very approximately correct. However, as a matter of practical fact, manufactured cotton in its natural state rarely contains less than 3 nor more than 6.5 per cent regain. It has been deemed wise by the committee, therefore, to set up these arbitrary limits in order most nearly to meet working conditions. The full regain or "standard conditions" has therefore been set at 6.5 per cent in the proposed tentative standards of Committee D-13.

Between the above limits of 3 and 6.5 per cent regain the strength curve is more nearly approximated by the straight line *d e*, for which the rate of increase is very nearly 6 per cent of strength for each per cent of regain. For actual working conditions, therefore, the form of the correction equation should be,

$$\text{Corrected Tensile Strength} = \frac{\text{Apparent strength} \times [100\ (6 \times 6.5)]}{100 + (6 \times \text{Actual Regain at Test})}$$

It is to be borne in mind that this formula is only applicable between regains of 3 and 6.5 per cent. It will not yield the bone dry strength at *c* on the assumption of zero regain, nor will it give full regain strength on the basis of 8.5 per cent regain.

The mathematics of Fig. 4 are as follows: In passing from bone dry to 8.5 per cent regain the increase in strength is from 170 lb. to 274 lb., or 104 lb. This represents 61 per cent of the dry strength or about 7 per cent increase in strength for each added per cent of regain. Between bone dryness and 6.5 per cent regain the strength increases by line *c d e* from a fictitious bone-dry strength of 190 lb. to 265 lb., or 74 lb. This represents 39 per cent of the imaginary dry strength of 190 lb. Thus within this range of 6.5 per cent regain there is an increase of 6 per cent in strength for each added per cent of moisture.

Fig. 5 shows the effect of correcting all the tests of Fig. 4 by means of the above formula. The straight line is the numerical average of all the tests so corrected.

Predicting Strength and Efficiency of Airplane Propellers

Charts and Formulae for Calculating Horsepower Absorbed and Torque Delivered at Given Engine and Plane Speeds

By F. W. Caldwell*

UNDER war conditions, when there is lack of time for extensive propeller trials and experimental work, we must be able to predict the performance of a propeller as to the horsepower absorbed at given airplane and engine speeds and as to its efficiency under these conditions. It is also necessary to make stress calculations for the purpose of predicting strength, since there is usually no opportunity for a destructive test before the propeller has to be put into production. The main purpose of this paper is to show how such calculations are made.

The first step is to choose a diameter. The chart, Fig. 1, shows the minimum diameter required to maintain the slip as low as 15 per cent. The chart also shows the maximum propeller speed that can be used for any given diameter and horsepower. If the speed is greater than that shown as the maximum, a smaller diameter must be chosen for the propeller, and there is a consequent loss in efficiency.

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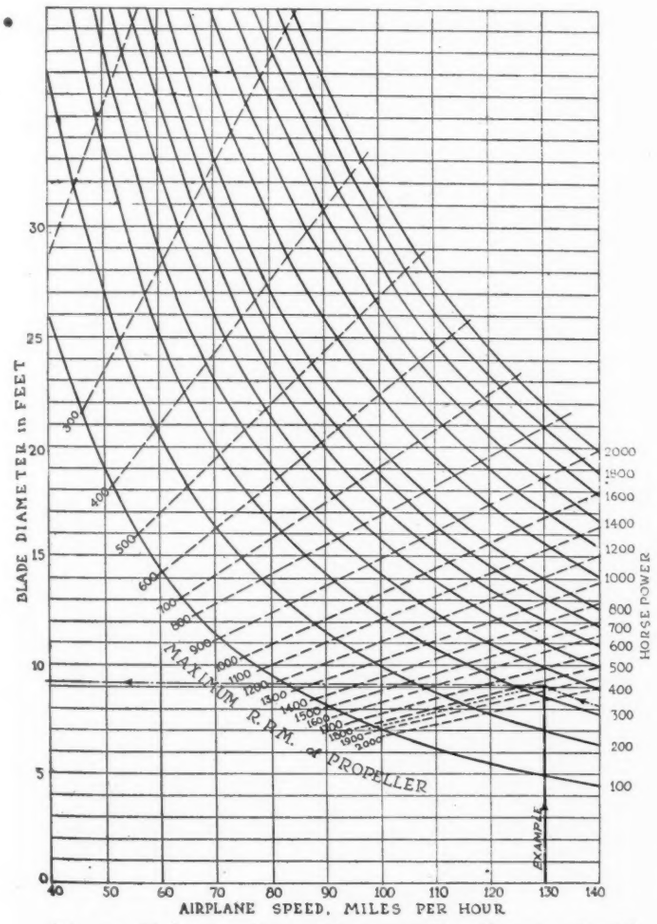


Fig. 1—Chart for determining propeller diameter for 15 per cent slip, and also maximum propeller speeds for given diameters and horsepowers

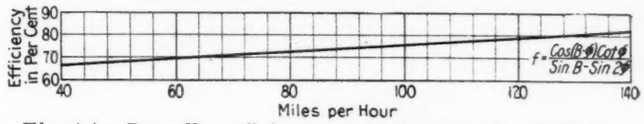


Fig. 1A—Propeller efficiency at various speeds of flight

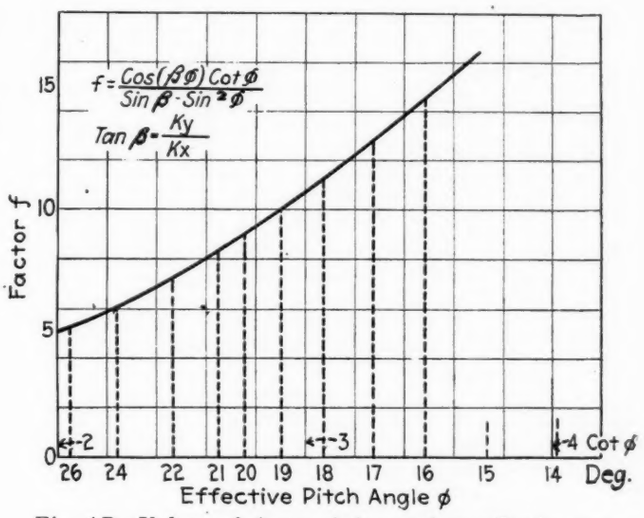


Fig. 1B—Values of factor f for various effective propeller pitch angles

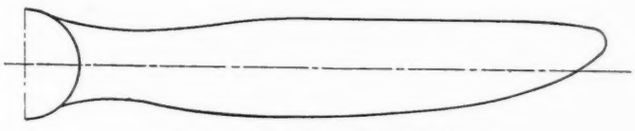


Fig. 2—Experimental blade form

The diameters given are minimum diameters for good practice. In general the diameter should be made as large as possible without making the blades so narrow that they will flutter excessively when wood construction is used. Plane designers should bear in mind the necessity of ample propeller diameter in laying out a power plant installation; an otherwise excellent design may be spoiled by limitations of clearance, resulting in too small a propeller diameter.

After determining the diameter, a blade form must be chosen. The question of the outline of the blade form is an unsettled one, since different blade forms are based on elaborate theories. The difference in efficiency of different blade forms is not great, but the difference in strength is considerable. The form shown in Fig. 2 is a fair one, both as to efficiency and strength.

The following nomenclature relating to propeller design will be used in this paper:

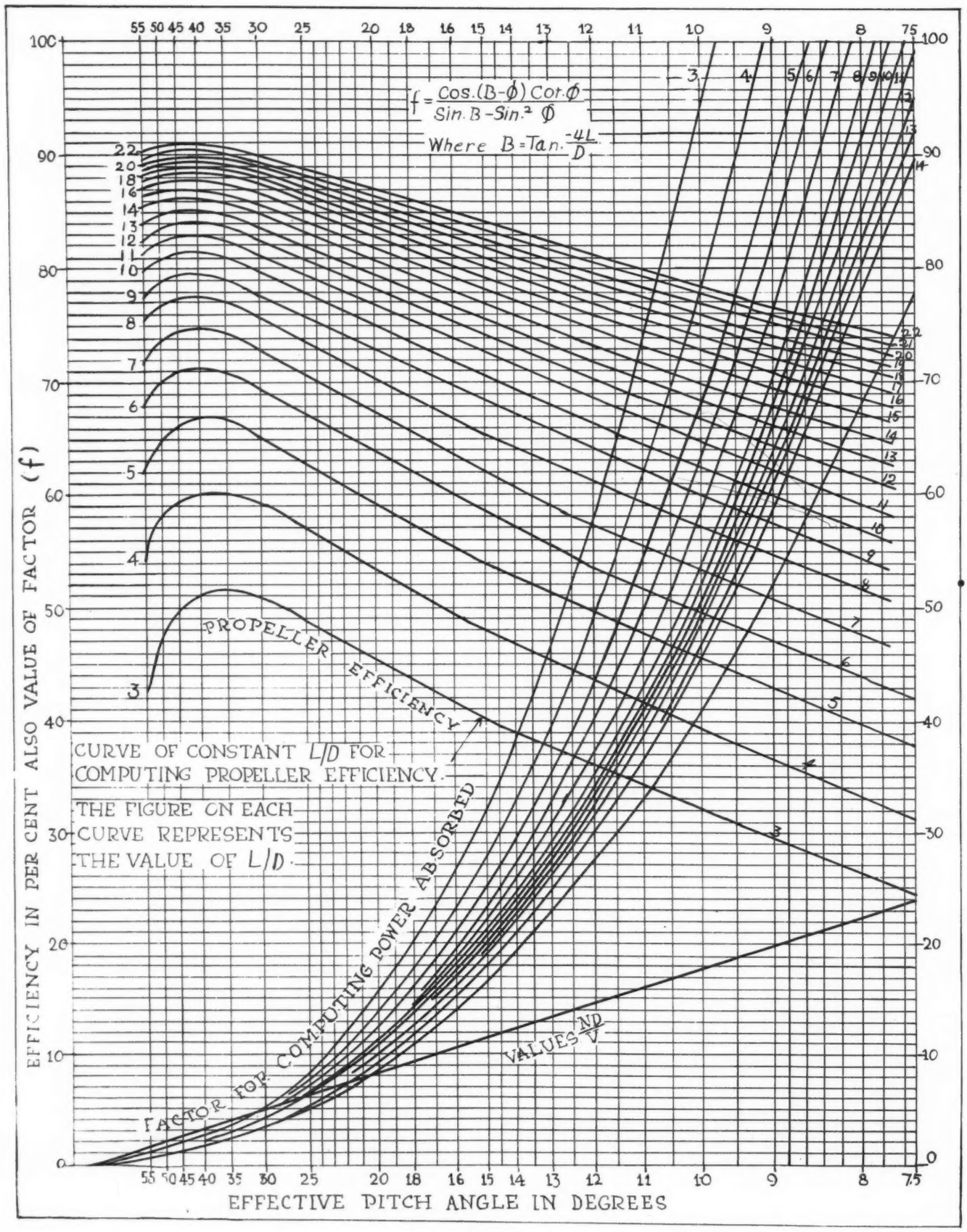

f = Cos.(B-ϕ) Cor.ϕ / Sin.B - Sin.² ϕ
Where B = Tan. -4L/D
PROPELLER EFFICIENCY
CURVE OF CONSTANT L/D FOR COMPUTING PROPELLER EFFICIENCY.
THE FIGURE ON EACH CURVE REPRESENTS THE VALUE OF L/D
FACTOR FOR COMPUTING POWER ABSORBED
VALUES ND/V
EFFICIENCY IN PER CENT ALSO VALUE OF FACTOR (f)
EFFECTIVE PITCH ANGLE IN DEGREES

Fig. 3

ρ = specific weight of air expressed in pounds per cubic foot.
g = acceleration due to gravity = 32.2 f.p.s.
K_y = lift coefficient, absolute units.
K_x = drag (or lift) coefficient, absolute units.
L = vertical component of force (lift) on aerofoil, pounds.
D = horizontal component of force (drag) on aerofoil, pounds.
f = factor for computing work absorbed by propeller.
C = empirical constant depending on blade form.
S = area of plane surface, square feet.
V = velocity of airplane, feet per second.
P_e = effective pitch of propeller or advance per turn.
V_1 = velocity (in helical path) of propeller element, feet per second.
v = velocity of slip stream, feet per second.
b = maximum blade width, feet.
b_1 = effective blade width, feet = $0.75b$ for blade form in Fig. 2.
N = engine speed at ground level, rev. per second.
N_1 = engine speed at 20,000 ft. altitude, rev. per second.
D = diameter of propeller, feet.
D_1 = equivalent diameter of propeller, feet = $0.580D$ (for computing work absorbed only).
R = radius of propeller, feet.
T = thrust, pounds.
A = area of propeller disk, square feet.
A_1 = effective area of propeller disk, square feet $\left(= 0.95\pi \frac{D^2}{4}\right)$ (as corrected for the 5 per cent area considered ineffective due to the radiator).
$\phi = \tan^{-1} \frac{V}{\pi ND}$ (effective pitch angle).
$\beta = \tan^{-1} \frac{K_y}{K_x}$
θ = blade angle, degrees.
e_1 = theoretical efficiency (Froude Method), per cent $\left(= \frac{100V}{V + v/2}\right)$
e_2 = aerofoil efficiency, per cent.
e = true efficiency, per cent $(= e_1 \times e_2)$.

It is necessary to solve for blade width and angle of attack by means of an empirical formula. As a rough rule the angle of attack may be taken as 2 deg. for plane speeds above 100 m.p.h. and 3 deg. for plane speeds below 100 m.p.h. The method of checking this would go beyond the scope of this paper, which is intended to cover only fundamentals.

The maximum blade width should be about one-twelfth the diameter for the best practice. This gives an "aspect ratio" of six for each blade.

The usual method of computing blade widths consists in dividing the blade into zones and treating each zone as a separate aerofoil. The power absorbed by each zone is then found from the formula

$$\text{Work for zone} = \frac{\rho}{g} K_y S V_1^3. \qquad (2)$$

This may be simplified by taking an average value of K_y for the blade and a weighted mean for the blade width. The power absorbed per blade is then found from the formula:

$$\text{Power} = \frac{\rho}{g} K_y b_1 R V^3 f C \text{ ft.-lb. per sec.} \qquad (3)$$

The value of f may be obtained by taking 0.58 of the diameter to represent an equivalent diameter for the whole blade. (This value has been established experimentally for blade form shown in Fig. 2.) Then the value of $V/0.58\pi ND$ is calculated, as is the corresponding angle whose tangent is $v/0.58\pi ND$, and the corresponding value of f is found on the chart, Fig. 3.

The ordinate corresponding to the angle is followed until it crosses the line corresponding to an L/D of the section, and the corresponding value of f is read on the scale at the right or left. An average value of L/D may be assumed with sufficient precision to be twenty, when using this method.

The empirical constant C is dependent on the blade form and must be determined experimentally. For the blade form shown in Fig. 2 it is 1.1, while it varies from 0.85 to 1.2 for different blade forms now in use. The symbol b_1 represents the weighted mean of the blade width. This weighted mean of the blade width is found by determining the mean ordinate of a curve in which the cubes of the radii of the blade sections are laid off as absissa and the corresponding blade widths are laid off as ordinates. This empirical method gives good results.

The best method of computing propeller efficiency consists in an extension of the water-propeller theories. The theoretical efficiency $V/(V + v/2)$ is computed. First the thrust is computed and then the slip-stream velocity from the impact formula $T = \frac{\sigma}{g} AVv$.

To compute the aerofoil efficiency a representative point along the blade is taken. This will usually be at 75 or 80 per cent of the radius according to the blade shape; for the blade shown in Fig. 2 it is at about 78 per cent. The product of the theoretical and aerofoil efficiencies gives the actual efficiency very closely. There is a further small correction due to the spiral component of the slip stream.

The angle whose tangent is $V/0.78\pi ND$ is found and a corresponding ordinate ϕ, Fig. 3, is followed until it crosses the efficiency line corresponding to the L/D of the aerofoil section at 0.78 of the radius. This L/D will be about twenty in good design.

Wood has been the favorite propeller material up to the

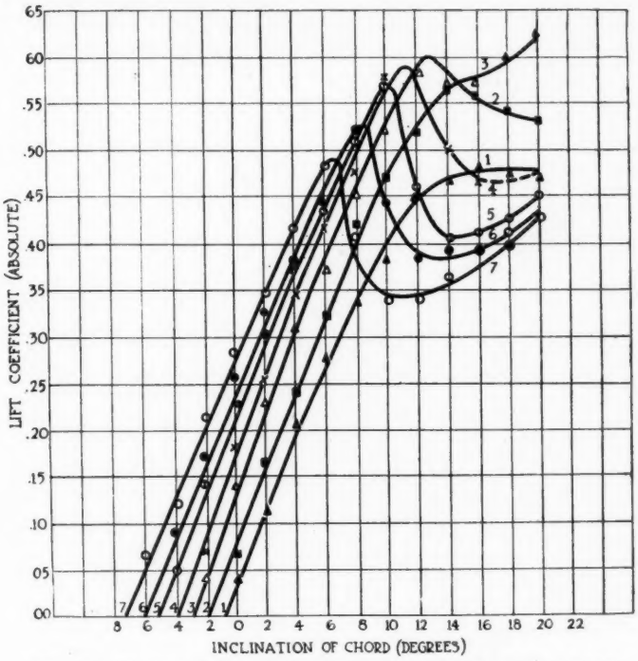
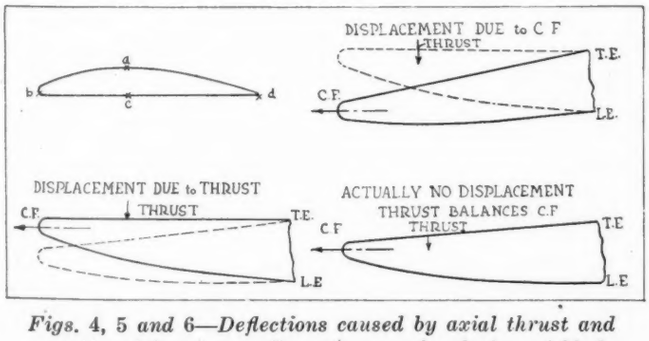


Fig. 7—Characteristics of typical aerofoils from the 1912 report of the National Physical Laboratory, England



Figs. 4, 5 and 6—Deflections caused by axial thrust and centrifugal force, as well as cross-sectional view of blade

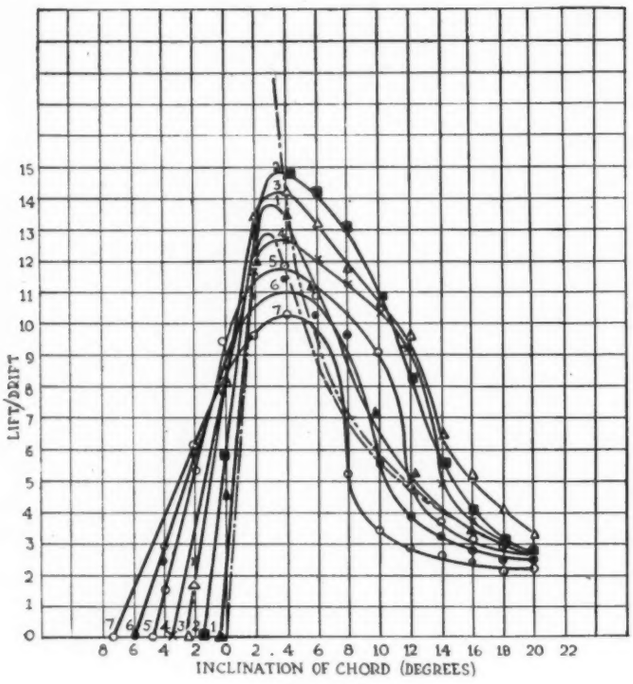


Fig. 8

present. Its success is mainly due to its high tensile strength, light weight and flexibility. Flexibility is an important factor in reducing propeller stresses, as can be seen from Figs. 4 to 6. When the thrust is applied to a wooden propeller, the blade bends and the centrifugal force creates a moment tending to restore it to its original position.

The lack of flexibility is evidently one of the weaknesses of steel propellers, since the metal cannot bend and accommodate itself to the different flying attitudes. This difficulty can be overcome for any single flying attitude and air density by offsetting centers of gravity of different sections in such a way that the bending moment due to air pressure is compensated for by the bending moment due to centrifugal force.

Among the propeller materials experimented with up to date the metals have shown the least encouraging results. While I do not consider a steel propeller out of the question, it is certain that the results to date have been discouraging. Steel propellers should be given a thorough ground test before being used in flight on an airplane, since the failures are usually extremely sudden and are disastrous to the plane structure.

Aerofoils

The aerofoil sections used have an important bearing on the propeller efficiency. The characteristics shown in Figs. 7-9 are taken from a report issued in 1912 by the National Physical Laboratory of England, and are about as good as any that have been published.

Adjustable-Pitch Propellers

Almost from the start of air-propeller work, a propeller with adjustable pitch has been considered highly desirable, because it is believed that the efficiency of the propeller could then be maintained constant for different airplane speeds. This is based on the theory that the L/D of the aerofoil section is the controlling factor in the propeller efficiency, a theory which is not borne out in practice.

Fig. 10 illustrates the effect of varying plane speed on the apparent angle of attack of a propeller section. This angle is usually chosen as 2 deg. for a flight speed of 130 m.p.h. and the aerofoil will then have a ratio of K_y/K_x of about twenty. In climbing at the rate of 70 m.p.h. the apparent angle of attack will be increased to about 10 deg., and the K_y/K_x ratio will drop to from ten to twelve.

Fig. 11 shows that the increase in true angle of attack is not so great when the slip stream velocity is taken into account; besides this, the theoretical efficiency $(V/V + v/2)$ is

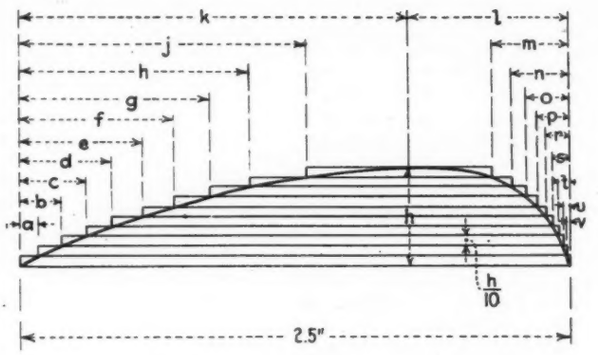


FIG. 9—DIMENSIONS OF TYPICAL AEROFOIL SECTIONS
(FROM N. P. L. REPORT)
All dimensions in inches

			Plane No.	h
$a = 0.085$	$h = 1.060$	$p = 0.140$	1	0.063
$b = 0.190$	$j = 1.315$	$r = 0.100$	2	0.125
$c = 0.305$	$k = 1.770$	$s = 0.070$	3	0.187
$d = 0.430$	$l = 0.730$	$t = 0.045$	4	0.250
$e = 0.570$	$m = 0.350$	$u = 0.025$	5	0.312
$f = 0.715$	$n = 0.255$	$v = 0.010$	6	0.375
$g = 0.875$	$o = 0.190$		7	0.437

greatly reduced in climbing and is not increased by an increase in the aerofoil efficiency.

An analysis of an adjustable pitch propeller (appended to this paper) shows no gain in efficiency. There is, however, a net gain in horsepower delivered to the plane, owing to the increase of engine speed in climbing. For the case in question the gain in the rate of climb is 49 per cent. Fig. 12 shows the gain in the rate of climb in a somewhat slower machine.

The keeping up of the engine speed becomes of interest in connection with the development of an engine with torque that is constant at high and low altitudes. From the performance curves shown in Fig. 14 it is apparent the climbing rate of a plane equipped with such an engine would be greatly improved if the engine speed near the ground were increased and kept the same as the plane climbs.

Constant Engine Power at Altitudes

It is the opinion of the author that, if it becomes desirable, an adjustable pitch propeller of fairly light weight can be built for a smooth running engine, such as the Liberty twelve, but considerable trouble may be expected with engines that have an inherent vibration.

The author has been told by many engine designers that it would be useless to build an engine to maintain its power at altitudes, because the propeller efficiency would then be so low that the net gain would be small.

All aeronautical engineers who have made a study of the subject realize that the development of an engine with constant, or nearly constant torque at altitudes up to 20,000 or 30,000 ft., is the one outstanding opportunity for improvement in airplane performance. It is just as easy to design propellers for operation at 20,000 ft. as it is to design them for performance at the ground level, so that the problem is one that must be solved by the engine designers.

The air density at 20,000 ft. is of the order of 50 per cent of that at ground level. The density of air is about 0.13 per cent of the density of water. Yet we are using the same means of propulsion in airplanes as is used in boats, and we are obtaining in practice efficiencies as high as 85 per cent, something which cannot be approached in marine practice. Not only is this true, but a propeller designed for use at 20,000 ft. will function without appreciable loss of efficiency near the ground, as may be seen fom an analysis in which airplane and propeller performance are worked out in a typical case.

The words "constant torque" as used in the following analysis mean that the torque is independent of both the engine speed and the altitude. This is the simplest case to discuss, and the discussion applies exactly to this case alone. An engine that satisfies this requirement only in part would,

of course, have a performance intermediate between that of the conventional gasoline engine and that of the engine with constant torque. This analysis is applicable equally to a steam turbine and is perhaps of more interest in relation to a steam turbine, owing to the range of speed involved.

In comparing the performance of the airplane and propeller at 20,000 ft. altitude and at the ground, we will assume:

1. Speed of airplane at ground level, 130 f.p.h., or 191 f.p.s.
2. Output of engine, 356 hp. (at 1400 r.p.m., or 23.3 r.p.s.).
3. Diameter of propeller, 11.5 ft. (area 104 sq. ft.).
4. Total lifting surface of plane, $S = 420$ sq. ft.
5. Total weight of loaded plane, $W = 3400$ lb.

The value of K_y in absolute units is computed from the formula

$$W = \frac{\rho K_y S V^3}{g} \tag{4}$$

$$K_y = \frac{3400}{0.00238 \times 420 \times 191^2} = 0.0933. \tag{5}$$

The corresponding value of K_y/K_x may be taken as 12.3.

(To be continued)

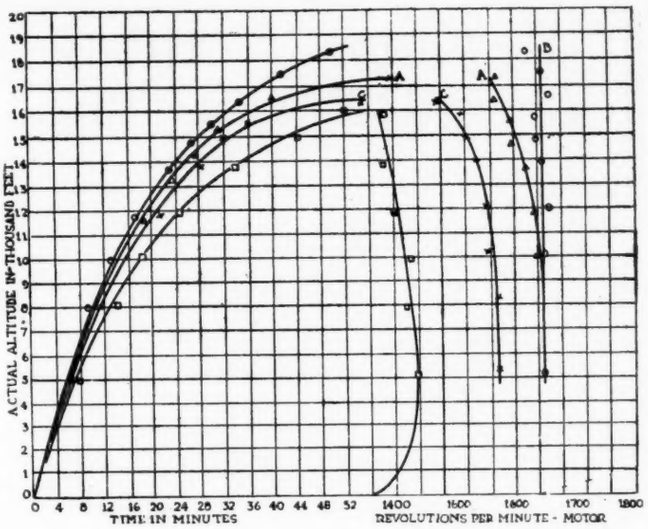


Fig. 12—Comparison of climbing tests of adjustable-pitch propeller

A—Pitch set at ground *C—Pitch set to check with D*
B—Pitch changed during climb *D—Solid wood blade*

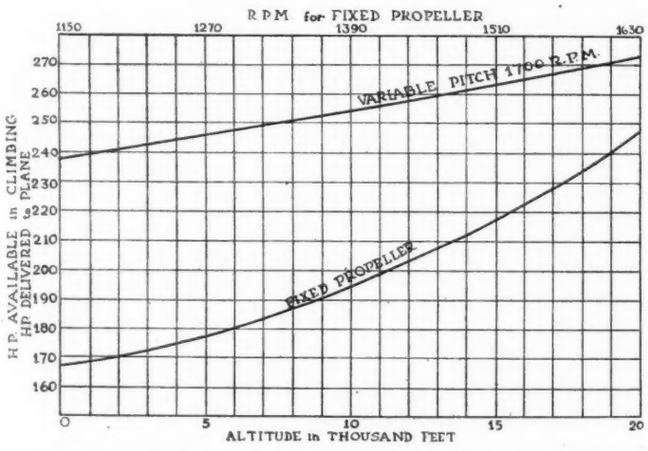


Fig. 13—Performance of propeller for constant torque engine

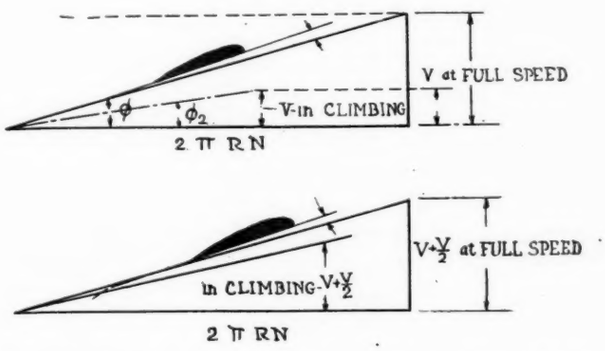


Fig. 10 (above) and 11 (below)—Effect of plane velocity on angle of attack

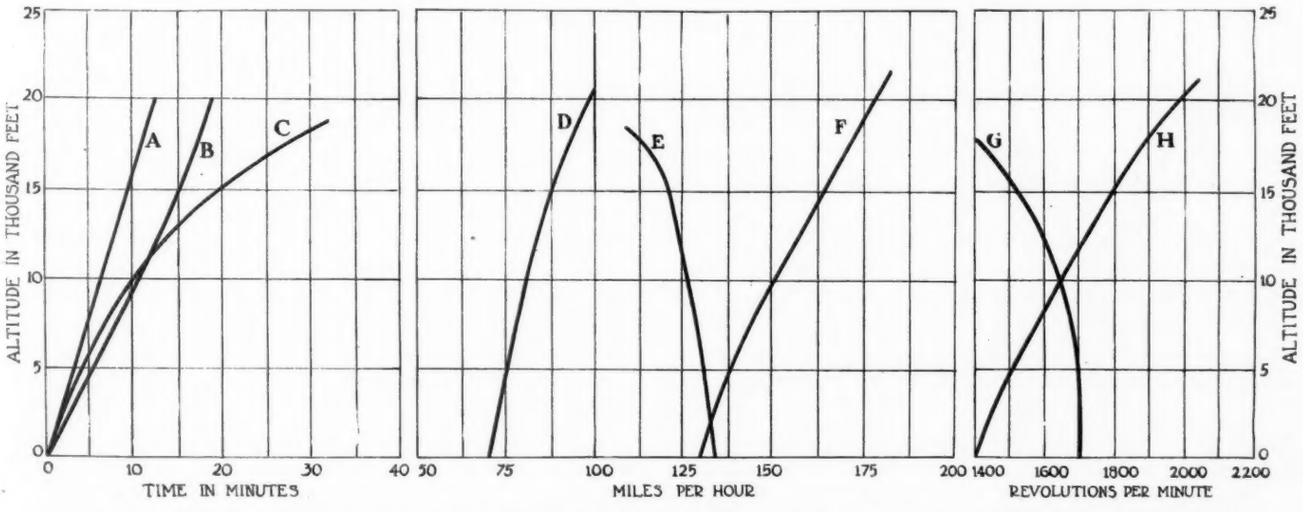


Fig. 14—Climbing and level flying performance of airplane with constant torque compared with that of a plane with a conventional gas engine

A—Time to reach altitude with a constant torque engine. B—Time to reach altitude with a constant torque engine and fixed propeller. C—Time to reach altitude with a conventional gas engine turning at 1650 r.p.m. near the ground, and with a fixed propeller. D—Best climbing speed for airplane. E—Level flight with conventional gas engine. G—R.P.M. in a level flight with a conventional gas engine and fixed propeller. H—R.P.M. in a level flight with a constant torque engine

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War Work and Commercial Work

MANUFACTURERS who have war contracts should exercise the greatest care to avoid even appearing to give too little attention to them and too much attention to their regular commercial work. Government work should and must come first.

Unfortunately there have been one or two instances in the passenger car industry where manufacturers, after having taken important war contracts, have laid themselves open to criticism by the Government because of a slowness in getting into production while at the same time their regular line was going through at its usual speed.

It is not for a moment thought that such delay is intentional or the result of a selfish indifference to the great needs of the hour, but its effect upon the industry as a whole is harmful to a degree that is not easily overcome.

When war orders and commercial orders clash, preference must necessarily be given to the work which is helping to shorten the war. Government work is the most important work for any and all of us to-day, and those who have an opportunity to do it in any shape or form are fortunate indeed and should seize upon it as a chance to do something well worth while.

The only way that we can crush the Hun is by combined effort. Put the war work first, speed it up to the limit and then turn attention to things commercial and do the best possible with them without interfering with Government production.

Let's Save Our Number Plate Steel

IT has just been announced that the 1919 number plates for the motor cars in New York State will be ready for delivery by the manufacturers to the State's automobile bureau beginning Aug. 1. It is estimated that half a million pairs of plates will be needed to meet requirements. Up to the first of this month there has been an increase in the number of cars registered of 44,130 passenger vehicles and 21,475 trucks over the corresponding period of 1917, and as the total registrations for last year in New York were 412,000 it seems that the estimate is by no means extravagant.

A pair of New York number plates weigh a little under 2 lb. This means that something like 500 tons of steel will be required to make the plates issued next year in New York alone.

The plates issued by the various states in the Union differ somewhat in size, but by taking the weight of the finished New York plate, which is about as large as any used, we can safely figure the total amount of steel needed for the number plates of all the cars in the country, and in doing so allow for waste.

Calculating on this basis we find that not far from 3500 tons of steel per year is used for the purpose of identifying motor cars—of providing the authorities, or others who would know, with a means of telling one automobile from another and who its owner is. Thirty-five hundred tons of steel is enough to build a good-sized ship.

Here is what seems to be an almost complete waste of good material which could be and should be stopped at once. Why is it necessary to change the number plates of all cars each year? The only answer that can be given is that changing the plates gives an opportunity to change their color or size or shape or the lettering on them and thus provides an easy means, an automatic means, of informing the police whether or not the annual registration fees have been paid. It sounds like a good reason, but is it?

They do not make us nail number plates on our houses and furnish us with a new one each year to show that we have paid our town, county and village taxes; they do not make us wear number plates and give us yellow, blue and green ones for different years to show that we have not overlooked sending

our checks to the Collector of Internal Revenue for that part of our incomes which we turn over to Uncle Sam.

Tax dodgers are not conspicuous because of any peculiar marks upon them, and yet they are not secure from or immune to the processes of the law. Motor car owners are no more likely to move their headquarters than are income tax-payers, and anyone will admit that the income-tax evader runs risks which most of us would not care to take. In collecting taxes or annual fees the burden is shifted from the collector to the one who does the paying in an amount proportionate to the size of the penalty for non-payment. Make the penalty large enough and the number of those who seek to evade tax payments can be reduced almost to zero.

Couldn't the whole matter of motor car registration payments be taken care of by a system which would provide for the payment of the fee or the return of the old plates on or before a certain day each year and for the issuance after that date to the local police authorities of a list of delinquents who could be hailed to court and either locked up for a time or heavily fined upon failure to show good reason why they should not be so treated? We think it could, and such a system would conserve enough steel in one year to build one more ship and save the states about $2,000,000 of the money they now spend for plates and a lot of work and incidental expense in handling them.

Let's turn our number plates into something essential.

Dynamometers for Aircraft Testing

ALTHOUGH specifications for the testing of Liberty aviation engines state that these will be made with testing clubs, or testing propellers, word has come from Europe through some of the Allied missions that such a form of test is not to be relied upon too specifically and that some testing apparatus of more specific nature may have to be used.

It is claimed that differences of 50 h.p. are possible with propeller tests when the wind is blowing into the propeller as compared with when it is blowing in an opposite direction. More engine power is naturally required under these conditions. There is also a difference in the power required for driving a propeller when the cutting edge of the club becomes frayed as it frequently does. Once frayed, the edge must be sandpapered down and revarnished which reduces its size and again upsets calculations.

Fitting electric dynamometers for testing all of the engines will prove expensive, but undoubtedly some form of compromise will have to be arrived at if reports from European Allies are borne out by practice in America. It is known that some of the European makers use the water-brake test. This suggests the possibility of using the water-brake test for general work and for perhaps 90 per cent of the testing when using the electric dynamometer for the final test to be sure rated horsepower is obtained.

Farm Implement Designs

THE expected is happening in that the refinement of the farm tractor and the using of better materials and improved design resulting in increased efficiency, is bringing about a re-designing of farm machinery, which for years has existed on what might be called a horse-scale design.

It has been apparent at the farm tractor demonstrations that two men are needed for much farm work. The farm machinery used was designed to be drawn by horses and operated by a person seated in the rear. With a tractor pulling the machinery and the operator seated on the tractor it has been necessary for another operator for the machinery. This has not been efficient. Two men cannot be continued in these war days on a job that one man can handle.

Nothing short of a mere revolution, so far as farm machinery is concerned, has set in. It has been under way for some months. Farm machinery is being re-designed so that the man on the tractor can operate it. The farm machine is being converted from the horse regime to the motor regime.

This revolution in farm machinery design is not solely confined to designing for one-man control, but improved materials are being used. For the first time alloy steel is taking its place in some farm products. This is cutting the weight very materially. In some cases the reduction approaches 100 per cent. Every pound of weight removed from the farm machine adds to the efficiency of the tractor.

The time is at hand when the use of anti-friction bearings will be much more general in farm machinery. It is not consistent to use the finest steels, the highest standard of design, the best anti-friction bearings, etc., in a tractor and then load to it a piece of farm machinery that has not been designed on the efficiency standard. The farm machine in the efficiency sense must be a running mate with the tractor. What the anti-friction bearings do toward increasing the efficiency of the tractor they will similarly accomplish in the farm machinery. The day is almost at hand when threshing machines will use anti-friction bearings. Revolving parts in other machinery will also use them. The same precautions to keep out dust from the bearings will have to be taken as are taken in the tractor.

Another aspect of this revolution in farm machine design is that the machine must be designed for longer life than is much of the present machinery. Government departments have stated that the life of some pieces of farm machinery does not average more than 80 days of useful work. This may be spread over a period of 5 to 8 years, but this does not add to the sum total of days of work. A tractor cannot be built for 80 days of service. It should work 120 to 150 days in the year, and while the life of the present design of tractor is not statistically determined, 5 years should be used as the basis of a conservative estimate. On this basis of reasoning, a tractor should have a working life of 750 to 800 days, or approximately ten times that of the farm machinery to which it is attached.

□ Latest News of the

Will Inventory All Steel in Factories

War Industries Board Wants This to Show Quantity on Hand at Present Time—Automobile Industry is Seeking a Sixty Per Cent Steel Allotment Agreement

WASHINGTON, July 17—Hugh Chalmers, representing the passenger car makers, held a conference to-day with the War Industries Board on the question of steel for the manufacture of passenger cars, and the result of the conference is that the War Industries Board has asked for a complete inventory from the passenger car makers showing the number of partly completed cars, number of parts, as well as the quantities of steel on hand for passenger car production at the present time.

Filing to Take 2 Weeks

Filing of these inventories will probably require 2 or 3 weeks and in the interim nothing can be done on the steel situation. It is expected that these inventories will show that the industry has not received steel on a basis of the 30 per cent reduction which was agreed upon between the War Industries Board and the industry some months ago and which agreement was to continue until Aug. 31, 1918. It is also expected that these inventories will show unbalanced stocks in many factories which will call for reasonable shipments of certain kinds of steel in order to complete the production of certain numbers of automobiles.

It is expected that the War Industries Board will announce its decision concerning further shipments of steel to the automobile industry after a thorough examination of these inventories has been made.

There seems to have been some counter-opinions concerning the steel the automobile industry has been using for some months. The makers have been operating on a 30 per cent curtailment but it is stated that since the 30 per cent agreement was entered into there have been later rulings on steel distribution and that the industry has not been receiving this allotment of steel.

60 Per Cent Allotment Asked

Mr. Chalmers asked the War Industries Board for a 60 per cent allotment of steel as compared with the 70 per cent allotment which the industry is operating under at present. No definite information could be given on such a request and nothing will be forthcoming until the inventories have been examined.

It has been known for some time that considerable inconvenience has been caused by the unbalanced inventories and several factories have received good co-operation in securing quantities of steel in which they were lacking and by means of which they have been able to carry on production that would otherwise have been impossible.

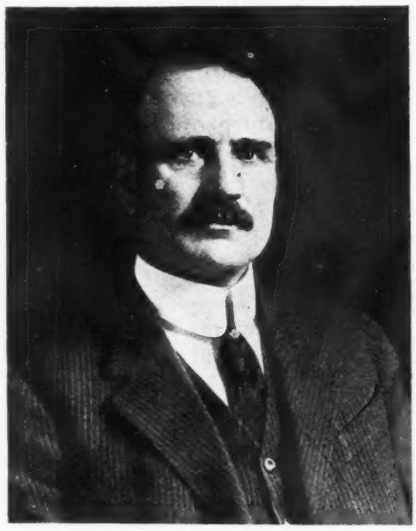
During the last week the steel manufacturers have met with representatives of the War Industries Board for a general survey of steel requirements. It seems utterly impossible to get a complete budget of the requirements of the Government. New shipbuilding yards are being erected and it is impossible to estimate their requirements. The amount of ship tonnage which it is possible to build this year is being cut down and now the steel makers feel that a sane estimate of the Government's requirements will soon be available.

At present the steel capacity for this year is running on a basis of 43,000,000 tons of ingots. This will produce between 33,000,000 and 34,000,000 tons of finished steel. The shell steel requirements will approximate 5,000,000 tons for the year. These figures of ingot production represent a gain of approximately 5 per cent in steel production as compared with a year ago. In the steel industry there is a greater amount of building operations going on than formerly. New mills for ship plate production being erected and additions to others made. Many believe that the requirements for shipping will not be nearly so great as the estimates because there are not enough shipbuilding ways to possibly utilize the steel plates which have been estimated in the requirements for this year.

Want Proper Proportioning

The steel makers are as anxious as possible to proportion steel to all of the different industries which are designated as non-essential to war work. The steel makers are also continually asking for a war budget of steel requirements and realize the almost impossible task of securing such. Their policy seems to be that of constantly cutting down estimates of Government requirements, realizing that these estimates are of necessity higher than actual needs will be.

Estimates that the Government requirements for the coming 6 months will be 20,000,000 tons are generally discounted to an extent. Steel production during the same period will, however, approximate very closely 16,500,000 tons of finished steel.



CHARLES W. NASH

Fuel Oil Engineers Needed

WASHINGTON, July 18—The oil division of the United States Fuel Administration is looking for several engineers proficient in combustion of fuel oil and natural gas. These engineers are needed to act as inspectors in different districts where they will visit all the factories using fuel oil and natural gas, the object of their inspection being the conservation of these fuels and perhaps the pro-rating of them as necessary. The divisions in which inspectors are to be placed are: Boston, Providence, New York, Philadelphia, Pittsburgh, Buffalo, Detroit, Chicago, Minneapolis, Tulsa, New Orleans and San Francisco.

The Oil Division prefers engineers who can act as volunteers in this work at their own expense, but it is prepared to pay a certain amount for those who cannot afford to devote all of their time to this work without compensation.

Cut Freight Rate for Road Materials

WASHINGTON, July 15—It is probable that the 20 cents per ton freight rate for stone, gravel, sand and slag promulgated by order No. 28 of the Railroad Administration will be reduced to a flat rate of 10 cents per ton. It is also probable that the 40-cent rate on brick will be cut to 20 cents. These reductions will be the result of the protest made here this week by the American Assn. of Highway Officials, Highway Industries Assn., The Portland Cement Assn. and the National Paving Brick Assn., which met with the committee under Judge Prouty and discussed the inequalities and injustices of the rates. Judge Prouty's committee hears all of the freight rate protests.

Automotive Industries

Nash Made Aircraft Production Head

Nash Assumes Charge as Assistant Under Ryan—Leaves Nash Motors

WASHINGTON, D. C., July 18—Charles W. Nash, president of the Nash Motors Co., has been appointed to take charge of engineering and production of aircraft matters in America, and assumed these duties to-day. He has resigned his active connection with the Nash company for the period of the war. Mr. Nash, in this new field, will act as assistant under the direction of John D. Ryan, chairman of the Aircraft Production Board.

This appointment should result in greater co-operation in the matter of aircraft engineering and production, and consequently lead to greater production and greater unanimity of the entire aircraft program. This action should lead to bringing together all the loose ends of the aircraft program. Heretofore there has not been enough get-together among those engaged in aircraft manufacture. Mr. Nash is one of the best known production executives in the country.

From the time he went with the General Motors in 1910 up to the present time, production has been one of his greatest objectives. His accomplishment in the Nash Motors, in the short time he has had control of that organization, gives indication of what may be expected in the airplane program.

Since taking over the Jeffrey factory it has been entirely reorganized on a production basis. Practically every department has been reorganized and practically every piece of machinery repositioned on a production basis. As a production executive Mr. Nash is one of those who goes through the factory every day and is directly familiar with every phase of the work. He gets his production information first hand. He makes his production studies first hand. He is a master of the art, which, coupled with his first-hand study policy, is directly responsible for his success.

It is hoped that in his new field in charge of engineering and production for aircraft engines, as well as planes, that Mr. Nash will be given an office and his organization located at some city in the aircraft manufacturing zone. Some weeks ago AUTOMOTIVE INDUSTRIES, in referring to the desirability of a director for aircraft work, suggested locating such a person in Dayton, Ohio, or perhaps some other city in the zone of this work. Just as Charles M. Schwab located the construction end of the Shipping Board in Philadelphia, so the engineering and production end of the aircraft program should be located in some city which would serve as a center of aircraft engineering, research engineering and be a large production center as well.

Mr. Nash was born near De Kalb, Ill., Jan. 18, 1864, and first became connected with the automobile industry through the Durant-Dort Carriage Co. In the fall of 1910 he was appointed general manager of the Buick Motor Co. and in 1912 became president of the General Motors Co. In July, 1916, he resigned the presidency of the General Motors Co. to form the Nash Motors Co., which took over the Thos. B. Jeffery Co., Kenosha.

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Wages Increase in Automobile Industry

WASHINGTON, July 16—Payrolls in the automobile industry for wages during April, 1918, show an average increase of 10 per cent over April, 1917. Fifty factories report 117,352 workers on the payroll for April, 1918, as against 125,407 in April, 1917. In spite of this, the payroll total increased from $2,761,526 in April, 1917, to $2,846,438 last April.

One automobile factory reported an increase of 25 per cent in wages as compared with an increase of 15 per cent in employees. An increase of 10 per cent to the foundry division of a passenger car factory was reported by another company. The foundry force equalled approximately 8 per cent of the organization. Eighty per cent of all employees in another plant received increases ranging from 7 per cent to 8.5 per cent, and about 90 per cent of the force of another establishment received an increase of approximately 10 per cent. The average productive hourly rate in each plant was increased 0.0067 per cent. Another factory reported an increase in the productive hourly rate but gave no data.

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Copper Concentrates Restricted

WASHINGTON, July 17—No licenses will hereafter be issued for the importation of copper concentrates containing less than 60 per cent of copper except for shipments from Cuba, Canada, and Mexico. This restriction is not to be construed as affecting importation of copper matte, blister copper or copper concentrates containing 60 per cent or more of copper, from any non-enemy country. The purpose of the new ruling is to bring about ocean transportation of copper in a concentrated form rather than as bulky ore.

Lack of Steel Causes Production Cut

Detroit Manufacturers Cannot Get Supplies—Parts Makers Are Short, Too

DETROIT, July 16—The critical steel situation is causing a cut in passenger car production in this territory and there is a difference of opinion as to just how long this will last. While the curve of passenger car production is rapidly declining, the curve of motor truck production is showing a steady upward tendency. Comparing production figures of May with those of to-day the average reduction in output of passenger car manufacturers would be approximately 33 1/3 per cent. The greatest cut in production is 50 per cent while many companies are suffering only a 25 per cent decrease.

A number of manufacturers, however, have not felt the necessity of decreasing their output and have been maintaining the same production since May. Among these are Packard, Overland and Hupp. Hupp shipped 1053 cars during June.

Much optimism is expressed regarding the steel situation. Manufacturers are inclined to think that it will be clarified within the next 60 or 90 days and that everything will be running much more smoothly then. It is generally conceded that conditions at Washington are in a rather unsettled state and manufacturers cannot be expected to feel easy until the turmoil there ceases. So many rumors originating in Washington have been current here that manufacturers are now turning deaf ears to them.

It is reported that the Ford Motor Co. is now producing 750 passenger cars as compared with 1550 during May. The production of the Paige-Detroit Motor Car Co. averages thirty-five cars daily as against fifty during May. Oldsmobile represents a cut in production of 33 1/3 per cent, now making 65 to 70 cars daily. Dort Motor Car Co. production has decreased almost 50 per cent. The Paige factory has 4000 orders for cars on its books which it expects never to be filled.

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Demonstrates Wire Cutter

WASHINGTON, July 13—John E. Logan, Kansas City, Mo., construction engineer, demonstrated a barbed-wire cutting machine attached to an armored tank at the Capitol grounds yesterday. Members of Congress and Army officers were present, and were gratified by the demonstration. Mr. Logan has offered his invention to the Government.

Device Combines Horn and Lamp

Invention of Molyneux and Stowe Will Be Marketed by the Wire Wheel Corp.

NEW YORK, July 10—The Wire Wheel Corporation of America has secured the patent rights to an interesting new automobile device, a combination lamp and horn. It is the joint invention of George Stowe and George E. Molyneux, both well known in the eastern automobile trade, Mr. Stowe being president of the Mitchell Automobile Co. of New York.

One advantage claimed for the combination is that it effects a marked saving in material, as the horn casing, bracket, trumpet, screws and clamp are rendered unnecessary. By combining the horn with the lamp the former is of course placed directly in front of the car, where it should be most effective. Enclosed in the lamp shell, the horn is protected from dirt, grease, oil and dust.

The construction worked out by the inventors is as follows: Near the rear of a standard lamp of the familiar bullet type, and below the horizontal diameter of the lamp, a hole is made, and the metal edges are turned up and ferruled. This aperture is slanted both downward and rearward, to prevent rain beating in, or the careless flooding of the lamp by the car washer. The ferrule becomes the supporting member of the signalling device, as well as the trumpet or mouth of the horn, as this is the opening through which the signalling sound is emitted.

The mechanism of the signalling device may be of any of the types now in common use. It is either made integral with or connected to the ferrule, and fits snugly in the rear of the lamp, back of the reflector. With the vibrator type of electric horn, the standard lamps are untouched, except for the making of the one hole, the bulb arrangement is not disturbed, and the wires of the horn are threaded through the tubular member of the lamp and its regular supporting post with the lighting leads. No outside wires are required.

It is not yet known what the intentions of the Wire Wheel Corporation of America are regarding the exploitation of the newly acquired rights. It is understood that the concern has a large plant at Springfield, Mass., at which the production of wire wheels was stopped when the war broke out, and which is now devoted to Government work. If the corporation should desire to enter into the manufacture of the combination lamp and horn this plant would evidently be selected for the purpose, as wire wheel manufacture could be concentrated at the enlarged main plant at Buffalo.

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Concession on Body Freights

WASHINGTON, July 15—Whereas a 33 1/3 per cent increase in the freight rates on bodies was proposed 6 months ago, the increased classification has been applied mostly to enclosed car bodies, according to a decision handed down to-day by the Interstate Commerce Commission. Open car bodies are little changed. The rate applies only on Eastern roads and not on those in the West and South.

The rates in the East, South and West, which are the three railroad rate divisions of the country, were three times first class on all bodies. When the rates were raised last fall all bodies were listed as four times first class in the East. No change was made in the three-times-first-class rate in the West and South.

The National Automobile Chamber of Commerce asked for a temporary suspension of this increase and for a hearing, which were granted. The hearing was held in January. The result is that the rate is raised to four-times-first-class on all bodies over 36 in. in height and remains three-times-first-class on bodies under 36 in.

A comparatively small percentage of touring and roadster bodies exceed 36 in. in height, which causes the rate to affect enclosed car bodies mostly. The arguments of Traffic Manager J. S. Marvin, of the N. A. C. C., at the hearing were mostly technical and did not relate to the essential character of different classes of bodies.

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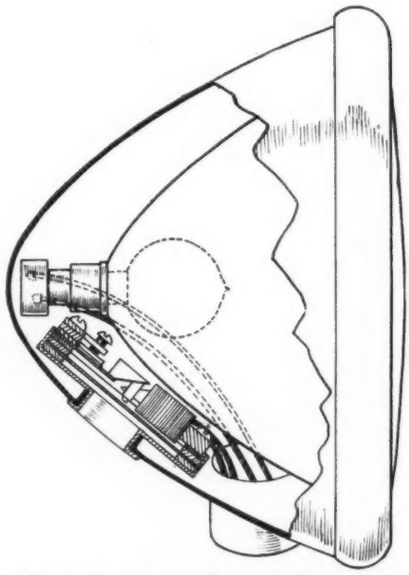
Hear Major Rice in Aircraft Inquiry

WASHINGTON, July 13—Members of the aircraft sub-committee of the Senate Military Affairs Committee held a secret examination to-day of Major C. A. Rice, of the American aviation service, who recently returned from France. Nothing was made public except that the testimony was technical and that the committee members were convinced that the American aerial fighting machines compare favorably with the types used by the Allies. It is quite likely that the report of the sub-committee investigations will not be completed for some time.



Internal construction of the combined horn and lamp to be marketed by the Wire Wheel Corp.

Order Reduction of Plow Types

War Industries Board Decreases Number as an Iron and Steel Conservation Measure

WASHINGTON, July 13—For the conservation of iron and steel, the War Industries Board has ordered a reduction of more than 3000 types of plows and tillage machinery for the farm. Out of 303 types of plows only sixty-five will be continued after Dec. 31, 1918. Of 300 types of corn planters and drills only ten will be continued, and of 107 types of harrows only forty-four will be continued after this date.

This reduction in number of sizes will do a great deal to reduce the size of stocks carried by the manufacturers as well as by distributers and dealers and will consequently lower the required capital needed for carrying on business. It has been known for some time that there were too many models of different kinds of farm implements, but such a broad pruning of the list was not expected.

The plan was the result of co-operative work by the industry. The tractor plows that are involved follow:

Light tractor plows, rigid beam, power lift, 2, 3 and 4 bottom, 3 wheel, will be made in 10-, 12- and 14-in. only.

Heavy tractor plows 14-in. only will be made in 4, 5, 6 and 8 bottom only.

Medium duty tractor plows, rigid beam, power lift, 3-wheel, will be made in 3 bottom 14 in. and 4 bottom 14 in. only.

Heavy engine disk plows will be restricted in manufacture to one type to each maker with 2 to 10 disks, set and equipped to cut from 20 to 100 in.

Light tractor disk plows will be restricted to one type only by each manufacturer, equipped with 2, 3, 4 and 5 disks.

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Canadian Ford Plant Closes

FORD CITY, ONT., July 12—About 2700 workmen of the Ford Motor Co. of Canada were thrown out of employment when the plant closed its doors last week. Shortage of raw materials is said to be one reason for the shut-down. The plant has used the large stock of raw material imported before extra duties were placed on such articles by the Canadian Government, and other stocks are said to be unprocurable. Officials of the company would make no statement other than that it is their usual custom to close the plant every summer for an inventory lasting 2 weeks or more. The shut-down is considered a "lock-out" by employees, who recently made demands on the company for increased pay, amounting to 62½ cents an hour, or $5 for an 8-hr. day. More than 3000 men will be affected, as the plants of the Fisher Body, Kelsey Wheel and Dominion Stamping companies, which are engaged in turning out parts for the Ford company, will be placed either on curtailed production or enforced layoffs. It is probable that the Government may take over the plant.

Car and Parts Curtailment Need Not Be in Proportion to Fuel Reduction

Coal Allowance to Manufacturers Will Not Be Estimated in Terms of Quantitative Output of Factories

WASHINGTON, July 15—The coal curtailment for 1918-1919—probably a 75 per cent cut—will not necessarily reduce the manufacture of passenger cars or parts 75 per cent.

The United States Fuel Administration will not estimate its coal reduction by a quantity car or parts reduction.

If a manufacturer of passenger cars or parts reduces his coal consumption for these commodities 75 per cent, but discovers an honest method for maintaining his production at 50 per cent of the 1917-1918 period, for example, the Fuel Administration will approve such activities.

In fact, the Fuel Administration is in favor of the greatest production possible and compatible with the 75 per cent coal reduction. This was made clear to-day by the Administration in reply to inquiries by AUTOMOTIVE INDUSTRIES.

The coal allowance to passenger car and parts manufacturers will not be estimated by enforcing a curtailment in the number of passenger cars or parts.

Methods of Estimating

It will be estimated by taking the requirements of 1917-1918 non-war work and cutting it 75 per cent, allowing 25 per cent of the coal consumption last year for non-war work for the 1918-1919 period.

It will apply only to passenger cars, as trucks and tractors, and the parts for these are considered as war work by the Fuel Administration.

In order to ascertain the proper amount of coal to be used for non-war work manufacturers will be expected to estimate accurately the coal consumption for the 1917-1918 period. They will be expected to deduct 75 per cent from this and use the remainder as a guide for their 1918-1919 requirements. They will be allowed 100 per cent coal for war work. They will not be allowed to use more than 25 per cent of the coal they have for non-war work regardless of the amount of coal they may have on hand.

Can Prevent Over-Consumption

While it is doubtful if the United States Fuel Administration has the power to take the surplus coal away from an owner, it has the power through the Lever Act to prevent the owner of that coal from consuming more than the amount prescribed by the Administration regulations.

Manufacturers engaged solely in non-war work can easily learn their position for the 1918-1919 period by checking up the coal requirements for the 1917-1918 period and allowing 25 per cent of that amount for the 1918-1919 period. Manufacturers engaged in non-war work and war work will be expected to observe the following plans:

1—Estimate accurately the average amount of coal per piece produced required for heat and power, basing these figures on the 1917-1918 period.

2—Estimate accurately the total amount of coal required for the period Aug. 1, 1917, to Aug. 1, 1918. Take 25 per cent of this as the coal allowance for non-war work for 1918-1919.

3—Estimate accurately the total amount of war work engaged in. Find the amount of coal required by using the coal per piece rate. Allow 100 per cent coal requirement for the war work.

4—Order 25 per cent of coal for the non-war work. Order 100 per cent of coal necessary for the war work. This will be the total coal allowance from the United States Fuel Administration

In using the figures "25 per cent," it is necessary to add that these are approximate.

The United States Fuel Administration has not yet definitely decided upon the actual allowance of coal to the automobile industry.

Dr. Harry Garfield has indicated that it will probably be 25 per cent of the 1917-1918 requirement for the 1918-1919 period.

Entire Matter Vague

The entire matter is as yet somewhat vague in the minds of the Fuel Administration.

It is not certain of the exact percentage curtailment nor of the methods of procedure in special cases.

It does not know, for instance, what would be done in the instance of a manufacturer of parts who in 1917-1918 not only supplied passenger cars made during that period but millions of passenger cars made in previous years.

Following is an example of how the manufacturer can approximately ascertain his coal allowance for the 1918-1919 period:

A. B. & Co. manufactured 3000 passenger cars Aug. 1, 1917-Aug. 1, 1918.

A. B. & Co. consumed 3000 tons of coal Aug. 1, 1917-Aug. 1, 1918.

A. B. & Co. have war contracts for 1300 passenger cars or for other materials using 50 per cent of plant.

The United States Fuel Administration allows:

One hundred per cent coal requirements for the war work for 1918-1919.

Twenty-five per cent of the 1917-1918 coal used in 1918-1919.

Using 3000 tons of coal for 3000 passenger cars, A. B. & Co. average 1 ton of coal per car.

Being allowed 100 per cent coal for war work, it orders for war work 1500 tons (war car order or 60 per cent of last year's consumption to meet the 50 per cent war work in their plant).

Being allowed 25 per cent of the coal consumed in 1917-1918 for non-war work, it orders for non-war work 750 tons of coal, which is 25 per cent of the 1917-1918 consumption. Thus the complete order is: 1500 tons for war work, 750 tons for non-war work, 2250 total allowed for war and non-war work, which is 75 per cent of the 1917-1918 coal.

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Holiday Lessens Coal Production

WASHINGTON, July 16—Bituminous coal production for the week ending July 6 was 10,250,000 tons as against 12,340,000 tons in the preceding week. The decrease of 17 per cent was caused by the observance of July 4. The daily average production for the operating days was practically the same as that of the previous week of 1917. The production for the 5-day week amounted to 1,000,000 tons more than for the corresponding week of 1917.

Anthracite shipments during the week of July 6 amounted to 31,493 cars as against 41,641 cars, a loss of 25 per cent, also due largely, according to the Fuel Administration, to observance of July 4.

During the week of June 29 the mines operated 84.3 per cent of their full time capacity. Losses against production were: Car shortage, 7.8 per cent; labor shortage, 0.8 per cent; mine disability, 2.8 per cent; no market, 1.2 per cent; all other causes, 3.1 per cent. Car shortage losses in West Virginia were 28.4 per cent, and in parts of Kentucky, 36.5 per cent. Material losses on account of car shortage were also shown in Pennsylvania, Illinois and Indiana.

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Labor Shortage Continues

WASHINGTON, July 12—Continuing shortages of common labor are reported by the weekly labor service of the United States Employment Service. Of the 109 offices which reported for the week ended June 29, 72 show a serious shortage. Three cities in California and 3 in Texas show a surplus of common labor, while 3 cities report normal conditions.

Common labor is especially scarce from Long Island Sound to the mouth of the Chesapeake River. The United States Employment Service is arranging to send men from Maine and Massachusetts, where the lack is not so serious, to meet this shortage. Common labor is greatly in demand from South Carolina to Texas, and in the North Central states, excepting Indiana, where there has been some surplus. In the mechanical and skilled-craftsmen divisions, there is a small but noticeable improvement due to the recruiting of skilled workmen and machinists by the United States Employment Service.

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Tractor Plant for Texas

ORANGE, TEX., July 15—The Blumberg Mfg. Co., San Antonio, will build a plant here for the manufacture of farm tractors. The new tractor will be adapted specially for use on rice plantations.

Labor Recruiting Plans Complete

U. S. Employment Service Will Cooperate with Factories to Get Unskilled Men

WASHINGTON, July 16 — Federal transfer of labor from non-war to war work will begin Aug. 1. At the same time employers engaged in war contracts and with organizations numbering more than 100 workers will recruit all workers solely through the United States Employment Service of the Department of Labor. It is anticipated that through these plans 4,000,000 workers will be shifted from non-war to war activities within the next few months.

The classifications of preferred industries as made by the War Industries Board in its steel schedule, and previously published in AUTOMOTIVE INDUSTRIES, will be followed by the Department of Labor.

Instructions were sent out to the war industries late last week following a 3 day conference of employment managers, state employment agents and officials of the United States Employment Service, authorizing war industries with field service forces to recruit labor under certain conditions after Aug. 1, in co-operation with the United States Employment Service. The full instructions are as follows:

Order blanks for workers are sent to each employer to be filled out and returned, within 24 hours, to the man in charge of labor recruiting for the United States Employment Service in the State where the factory is located. The information sought by the blank is used to ascertain the total requirements of industries for unskilled labor, and the requirements by states for each particular industry and factory. Filling out and returning the blank does not mean that a manufacturer will obtain immediate relief of labor shortage. This is the goal aimed at for the future.

As soon as an employer fills in his order he will be notified by the United States Employment Service of the office and agent assigned to co-operate with him in getting the unskilled labor. The employer should immediately get in touch with this agent.

The total of the present needs of the war industries for unskilled labor will be divided into quotas among the states and sub-divided among communities. Vigorous efforts will be made in each community to secure the alloted quota in such a manner as to prevent taking labor from war industries or firms or needlessly crippling non-war industries. So far as possible recruiting for each plant will be centered in certain definite states and localities.

Employers with a field force for recruiting labor may continue these organizations under the direction of and subject to regulations of the United States Employment Service. Authorization for continuing such organizations is to be secured from the men in charge of the work of the United States Employment Service in the state in which the company is located. Such authorization is subject to withdrawal at any time, but will be continued so long as it works satisfactorily.

In order to stabilize labor recruiting and distribution a Community Labor Board will be organized in each community, made up of a representative of the United States Employment Service, a representative of the workers and a representative of the employers. It will assist in recruiting local labor, but its principal function will be to decide on the relative needs of local establishments and prorate labor supply when it is inadequate.

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Labor Administration Organization Completed

WASHINGTON, July 13—The new bureaus of the War Labor Administration of the Department of Labor as finally organized are:

Women in Industry Bureau—to deal with problems involving women.

Conditions of Labor Bureau—to set up and administer conditions of labor, including safety, sanitation, etc.

Training and Dilution Bureau—to train workers for war occupations. This organization will have jurisdiction where industries lack skilled workers and it becomes necessary to dilute the skilled supply with those who are less skilled.

Bureau of Labor Adjustments—to have jurisdiction over strikes, lockouts, etc.

Insignia Service—to reward war workers by means of badges, etc.

Investigation and Inspection Service—to handle investigations other than statistical.

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Condemns Competition For Labor

WASHINGTON, July 12—The using of competitive peace-time methods in the procurement of labor is strongly disapproved by a resolution of the War Industries Board. Henceforth the Board, through its Priorities Division will in proper cases withhold priority assistance from employers who persist in using competitive peace-time methods which result in the withdrawal of labor from war industries.

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Repairmen Not to Be Reclassified

WASHINGTON, July 12—Repairmen in garages and repairshops will not be affected by the "Work or Fight" order recently promulgated by Provost-Marshal General Crowder. This ruling was made to-day by the office of the Provost-Marshal here and is definite. It does not matter whether the repairmen are working on trucks or passenger cars, according to the office of the Provost-Marshal, and those local draft boards which are reclassifying repairmen under the order are acting without proper authority.

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Calls Men to Cut Spruce

WASHINGTON, July 13 — Provost-Marshall General Crowder yesterday issued a call for an additional 3000 men from 38 states to cut spruce wood in the forests of the Northwest for airplane construction.

How Women Should Be Employed

Statement of the Government's Attitude Toward the Use of Female Labor in War Work

WASHINGTON, July 13—The shortage of labor in essential war industries should be met so far as possible by the increased use of women in clerical and office positions. Women should not be employed in occupations physically or morally unsuited to female labor. These and other principles setting forth the Government's attitude for the employment of women in the war emergency are included in a resolution issued by the War Labor Policies Board here to-day. The resolution will govern the work of the new division of Women in Industry of the Department of Labor which was created this week. The resolution is in part as follows:

The existing shortage of labor aggravated daily by the military and naval demands of the Government and the withdrawal from civilian occupations of a quarter of a million additional recruits each month necessitates widespread recourse to the labor of women.

Standards as to hours, night work, wages and other labor conditions, as recommended by the Chief of Ordnance and the Quartermaster-General should be observed by all employers.

The shortage of labor in essential war industries should be met in part by further introducing women into occupations easily filled by them, such as clerical, cashier and accounting service in manufacturing, mercantile and financial establishments and in the offices of transportation companies and other public utilities; such as sales clerks and floor walkers in mercantile establishments.

Women should not be employed to replace men in occupations or places of employment clearly unfit for them owing to physical or moral conditions, as for instance, in bar rooms, saloons, pool rooms, mines, smelters, quarries, furnace work, glass works, etc. Girls under 21 years of age should not be employed where it is clearly unfit for them owing to their youth, as for instance in public messenger service, street car, elevated and subway transportation, as elevator operators or bell boys.

The introduction of women into war industries or other employments involving special hazards such as the use of industrial poisons should be guided by the standards of health, comfort and safety as defined by the various Governmental departments.

Introduction of women into new occupations should be guided by regulations concerning hours of labor, night work, etc., as adopted for instance by the Industrial Commission of Wisconsin.

Recruiting of mothers of young children for war industries should be discouraged.

Introduction of women into positions hitherto filled by men should not be made a pretext for unnecessarily displacing men.

The services of the division of women in industry should be sought by employers with regard to introduction of women in industry and the working conditions which should be established.

Older men should be more generally employed. They constitute a largely unused labor reserve. It is estimated that since the

war began the maximum age for employing men has advanced 10 to 12 years, that is from 38 to 50. It has been found that tasks can be graded for these workers according to their strength, and that work unsuitable for women, especially at night, can be performed by them.

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Deliver 2514 Liberty Engines

WASHINGTON, July 16—The delivery of Liberty engines for all purposes on July 5 was 2514. At the same time 450 DH-4 or DeHaviland battleplanes, each designed for two men and fitted with four machine guns, had been shipped.

Rumors are beginning to be spread in Washington as to the report of the Senate Military Affairs Commitee which is investigating the aircraft situation and whose report will be filed soon. This committee has visited many of the aircraft factories. Undoubtedly this report will deal largely with Liberty engine production as well as the manufacture of battleplanes.

Members of the Aircraft Committee state that quantity production has just been arrived at in the matter of engines, and that the Handley-Page and Caproni types are now starting in production. They say that for these types "the Liberty engine cannot be beat."

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Marmon Delivers First Liberty Engine

INDIANAPOLIS, July 15—The first Liberty engine to be completed by the Nordyke & Marmon Co. ended its 50-hr. trial run, 55 min. after midnight Saturday and has been accepted by government officials, who came from Detroit to inspect it.

Following the long period test, the engine was taken apart and each unit examined separately to determine what wear or strain, if any, was visible after the endurance run. For most of the time the engine was on the block, a normal speed of 1650 r.p.m. was maintained, and for shorter spaces higher speeds were attained.

The Nordyke & Marmon plant will immediately enter upon quantity production. The company has already built and delivered 1000 Hall-Scott engines and completion of this order has delayed production of Liberty engines.

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A.E.F. Motor Transport Corps Organized

WASHINGTON, July 16—Motor truck transportation in France has been made an entirely separate division of the Army and will hereafter be called the "Motor Transport Corps."

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Packard Not to Change Its Car

DETROIT, July 15—The Packard Motor Car Co. will continue its present 12-cylinder passenger car model substantially without change for an indefinite period.

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G.M.C. to Erect Body Plant

ST. LOUIS, July 12—The General Motors Corp. has purchased a plot of 105 acres here, and, it is stated, will erect a plant for the manufacture of bodies.

South Africa Using New Motor Fuel

Natalite, a By-Product of Sugar Is Found to Be Cheaper But Less Efficient Than Gas

JOHANNESBURG, SOUTH AFRICA, May 25—Natalite, a bi-product of sugar is being used as an automobile fuel in this part of South Africa. Although this fuel is not nearly so satisfactorily as gasoline or kerosene due to carbonization of the engine, there is nevertheless a good deal of interest in it because it is much cheaper than imported gasoline and kerosene. It is being sold at 75 cents an Imperial gal. in wholesale quantities, and at points on the coast at a lower price. Gasoline is selling at $1 a gal.

In addition to carbonizing the engine, natalite does not give as much power as gasoline and kerosene. The feeling is that its quality as a fuel can be improved and distributers are looking forward to it with interest.

A shortage of gasoline is one of the automobile problems of South Africa. It has resulted in a large number of automobiles already being placed in storage. Gasoline has been as high as $1.25 per gal., and the price generally ranges between $1 and this figure. Some of the distributers have recently imported large quantities of American gasoline, but the economy has been slight in so far as price is concerned.

Considering the population of South Africa, the number of automobiles imported and sold is great. The entire white population is little more than 1,000,000, which is one-fifth that of Australia and about one-ninth that of the Dominion of Canada.

The demand for motor trucks is not large and is confined principally to larger cities. A possible exception is that territory known as the South Western African Protectorate, which is a sparsely populated section and one in which motor trucks are badly needed.

On some of the larger farms of the Cape Province, farm tractors have been introduced but it will be some time before the tractor will be an attractive proposition to the South African distributer. The cheap price of oxen which cost the farmer nothing, is largely responsible for this. Another fact is that the native farmer is ignorant of machinery, and the tractor would be badly abused in his hands. The sale of automobiles to the farmer is a useful missionary work since it educates him for the tractor.

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British Aircraft Production Increasing

LONDON, June 28—During the 3-month period from March to May, production of airplanes in England increased 116 per cent over deliveries from June to August, 1917, according to a statement by the Aircraft Production Department of the British Air Ministry. In the same 3-month period, production of engines increased 105 per cent. The statement adds: "The increase in the fighting value of the airplanes is very much higher than these figures would indicate, as the engines delivered during the 3 months just completed are of a much higher and more powerful type than those delivered during the 3 months of 1917." At the present time there is a considerable quantiy of planes in storage ready for engines, but it is anticipated that these will be fitted in the near future.

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Housing Corporation Formed

WASHINGTON, July 14—The United States Housing Corp. has been created to take over the functions of the Bureau of Industrial Housing and Transportation of the Department of Labor. This new organization is expected to afford more facility in operation. The charter was taken out under the laws of New York State. The articles of incorporation provide for issuance of 1000 shares of stock without par value, of which the Government holds 998 shares and O. M. Eidlitz and G. G. Box one share apiece.

The executive officers of the corporation are: President, Otto M. Eidlitz; vice-president, Joseph D. Leland; treasurer, George G. Box; and secretary, B. L. Fenner. These, together with Albert B. Kerr, J. W. Alvord and William E. Shannon, will serve as directors.

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Engines for Ordnance

NEW YORK CITY, July 17—The Trego Motor Corp., New Haven, Conn., which was given a contract to manufacture Liberty aircraft engines for aircraft purposes, has transferred its manufacturing activities from aircraft to the Ordnance department. It will continue the manufacture of the Liberty engine, but for Ordnance purposes. This company has gotten into production in a small way, but has facilities for approximately twenty-five engines per week. The factory is well fitted up for dynamometer testing of these engines, having two Sprague testing units capable of handling 800 hp. engines and four other units capable of handling 400 hp. Although the Trego corporation has not been in production to any extent it has for many months been producing parts for the Liberty engine in quantity.

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Badges for War Workers

WASHINGTON, July 16—War badges for industrial workers employed at least four consecutive months in Government war industries, will be issued through the U. S. Employment Service according to a new plan just announced. The badges will comprise some design not yet completed of service bars. They will be given to workers in those industries where work is in sufficient volume and importance to require the supervision of a Government official or a plant certified by the chief of a Government department as sufficiently important in war work to merit badges.

General Lee of the British Mission ready for a flight in his Avro plane

General Lee landing with a passenger after a flight with loops and spiral falls

Planes Hover Continually Over the American Capital

WASHINGTON, July 12—Flying has become a daily event here with the construction of a large hangar at Potomac Park housing several Curtiss J-N 4 airplanes. A DeHaviland airplane equipped with two Liberty engines has just been added and two Spads are expected shortly. In addition there is an Avro airplane here, shipped from England, built by A. V. Roe & Co. and equipped with a 100-hp. Nome engine. The Avro plane is the property of the British Mission and is used exclusively by General C. F. Lee who heads the British Aeronautical Mission in this country. General Lee was practically the first flier to exhibit the maple leaf drop, the "Immelman" loop, the spiral fall and the other "stunts" used at the front, in Washington. His exhibits have been watched with great interest by President Wilson and the various War Department officials.

Many fliers are stationed in the aviation section in Washington at desk work. In order to maintain their records and to secure the 25 per cent extra monthly pay allotment awarded to fliers provided they are in the air a certain number of hours each month, these men make frequent use of the Curtiss J-N 4 planes. Several may be seen flying each day at all hours, over the State, War and Navy buildings, the White House and the city proper.

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New Export License Regulations

WASHINGTON, July 15—Partial shipments from interior points or ports of exit where licenses can not be readily presented, will no longer be allowed by means of the special partial shipment certificate sworn before a notary public, or a certificate of transfer drawn by a collector of customs. The use of these forms, EAB-23 and WTB-176, were discontinued on July 10.

Partial shipments against export licenses may be made in the following manner except in instances when the license itself can be presented at the port of exit:

The shipper will prepare a Shipper's Export Declaration in quadruplicate and will endorse upon the back of the license in the space provided for the purpose the full details of the partial shipment he desires to make. He will then present the Declaration (4 copies) and the license (with the partial shipment endorsement on the back) to any postmaster of the first or second class or to a collector of customs. The postmaster or collector to whom the papers are presented will compare them and if they agree in fact, that official will countersign and date the partial shipment endorsement on the back of the license and will stamp all 4 copies of the Shipper's Export Declaration with an official partial shipment stamp and sign and place his seal on such stamp. He will then return the license and all 4 copies of the Declaration to the shipper. . The collector of customs at port of exit will allow the partial shipment to proceed upon presentation of the Declaration, so stamped, signed and sealed.

Shippers located in cities where there are no collectors of customs but where the post offices are of the first or second class, may communicate with their postmaster and ascertain at which post office station, if more than one, and at which window this service will be rendered. The attention of shippers is called to the fact that postmasters in cities wherein are located collectors of customs will not exercise this authority. Shippers in such cities may apply to a collector of customs.

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Navy Workers Needed

WASHINGTON, July 12—Workers are needed to assist in building seaplanes in the Naval Aircraft factory at the Philadelphia Navy Yard. The plant, which builds seaplanes for hunting submarines and serving as convoys to merchant ships, is being expanded, and several thousand workers are required. It is not considered desirable to take the workers from other aircraft factories or from any concerns engaged in Government work. There is a scarcity of men to work on the bracing wires which support the wings and hull of the seaplane. Men experienced in splicing small woven wire cables are preferred. Tube benders who have worked on bending small steel tubing in bicycle factories or furniture factories are needed. Coppersmiths, acetylene welders and braisers for work on metal parts, and a limited number of tool designers and tool makers are required. Boat builders who have designed or built small racing boats or schooners can be used to advantage in building the hulls.

In the final assembly of the seaplanes, men who have worked on assembly of automobiles are needed. Active, intelligent young men with but slight experience in handling of tools and who are taking engineering courses in colleges or universities are also sought. In fact any man with 6 months' experience at shop work can obtain a job.

Detroit's War Contracts Will Reach $2,000,000,000

DETROIT, July 16—In all probability, $2,000,000,000 worth of war work will be in the city of Detroit within the next twelve months, according to J. Hubbert Cullen, secretary of the Resources and Conversion section of the War Industries Board for Michigan. This means that Detroit manufacturers will be working on an amount about double the present contracts.

At the present time 90 per cent of all Detroit's industries are working on war contracts or sub-contracts, but in comparatively few cases are the plants engaged to capacity. In many cases the proportion of war manufacture is as low as 5 per cent. In such plants the production of war needs will be greatly increased. These estimates are based on Mr. Cullen's recent survey of Detroit's industries.

At present this city leads the country in the percentage of industries working on munitions, but the large contracts are concentrated in the larger factories and it is expected that the future will see all factories, large and small, use their facilities for war work. In many cases factories are not equipped to take war contracts but the majority can be converted to this character of work with little difficulty. As an instance, there is one wood-working factory which occupies only 5 per cent of its facilities for airplane body work. This factory alone could turn out hundreds of completed bodies a week.

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Government Trains 12,000 Men

WASHINGTON, July 15—More than 12,000 men have been trained for the United States Army through the war trading division of the Federal Board for Vocational Education. Six thousand of these were trained in mechanical lines. 5000 in radio work and 1000 in clerical occupations. It is estimated that an additional 3000 men have been trained by private agencies through impetus given to the work by the Federal Board, using Federal Board courses of instruction.

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Grossman Gets Post Office Contract

NEW YORK, July 12—The post office department in Washington has awarded a contract for Red Head Vitristone spark plugs to the Emil Grossman Mfg. Corp.

Truck Sales Are Good on Seaboards

Detroit Territory Coming Back After a Month's Lull—Many Trucks Idle

DETROIT, July 16—All truck manufacturers in Detroit territory report very brisk business on the east and west seaboards, but throughout the middle of the country in sections a lull in sales is manifest. Although there are scores of prospects in these sections and the desire to own trucks is present, the sales are backward. A depressed condition seems to prevail.

This condition, the manufacturers state, is only temporary and are optimistic about it; many producers already see an easing up of the situation and note a slight increase of sales in some parts.

The city of Detroit is just coming out of such a lull. During June the truck business, it is reported by most retail agencies, has been at a standstill and none was able to determine the cause. Most persons lay it to the fact that solicitations for various war activities swerved money to other channels; others are of the opinion that this territory is oversupplied with trucks, while still others are satisfied with the thought that the depression is a natural one at this time of the year.

It is a fact that Detroit has an oversupply of dump trucks at this time. When the city was enjoying its building boom some time ago a large number of individuals entered the building and contracting business and bought great numbers of this type of trucks. Now these vehicles are standing idle in many garages, only a few being converted into types suitable for regular truck service. It seems enough work cannot be found to keep all these idle trucks in use. One local contracting firm that owns over one hundred trucks has an average of thirty to forty trucks idle every day and has found it necessary to advertise that it has vehicles for outside service.

The sales of many manufacturers show a decrease of 20 per cent in this territory. It is believed that the South will be the first section to come out of its state of depression, due to the coming cotton crop. The east and west coast have been active because of the great quantities of material handled there; there is more moving in these sections.

The decreased use of trucks has caused a corresponding lessening of tire sales. The Detroit branch of the B. F. Goodrich Co. reports a marked dropping off of business in the truck tires sales. This condition is noted with other tire agencies.

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U. S. Rubber Sales $100,000,000

NEW YORK, July 15—The United States Rubber Co. in the 6 months ended July 1 did a gross business of approximately $100,000,000, which is only $16,000,000 less than the sales of all of 1916. In 1917 sales amounted to $176,000,000. More than 15 per cent of the company's business at present is government work. In the order of importance, from the standpoint of Government contracts, the various departments rank: First, boots and shoes; second, tires; third, mechanical goods.

The tire business of the company, on sales to dealers in the first half of 1918, showed a large gain over 1917. Tire business is divided into two departments: Sales to dealers and sales to manufacturers of automobiles. Sales to manufacturers are less than those of last year. The company is finding it difficult to manufacture enough tires to satisfy the demands for cars built before Jan. 1, 1918.

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First Eagle Launched

DETROIT, July 12—Without a semblance of ceremony and with less than a hundred spectators outside of the Ford employees and the naval men, Ford's Eagle-1 was launched yesterday. With hardly a hitch, the 200-ft. boat was brought out of its housing and lowered into the water.

Unlike other launchings where boats are built at the water edge, the Eagle had to be conveyed a distance of about 500 ft. before it could be placed in the water. This new type of sea-fighter or submarine chaser is assembled on a long conveyor resembling an elongated freight car. When completed the boat is pulled on its conveyance to a transfer table and brought to the launching well.

The transfer table is a large square area sunk about 3 ft. below the floor of the construction building, and on this are 16 parallel railroad tracks placed about 15 ft. apart. A trestle-like construction with a small engine house abutting one side, in the middle, spans these tracks. This contrivance also has four tracks, and receives from the construction building the conveyance on which the boat is resting and carries it to its launching place.

Here the boat is pulled off the carrier with a cable onto tracks on another platform which is then lowered by means of hydraulic power and the boat is floated.

The boat resembles a speed boat with its tapering bow and blunt stern. It will draw 8 ft. when fully equipped and ready for sea. The motive power is a steam turbine geared to the propeller shaft on which is mounted a single three-bladed screw. Crude oil fuel will be used to generate steam. The tank capacity of the boat is sufficient for a steaming radius of at least the distance across the Atlantic Ocean.

There is not a forging or a rolled beam in the ship. Everything is pressed from sheet metal, cold, by means of automatic machinery that cuts every piece to an exact pattern, then punches the rivet holes and bends every part to its final shape.

It will not be long before the next Eagle will go through a like program. It is expected that ultimately the plant will reach a production of one a day.

Goodyear Employs 3000 Women

Female Labor Successfully Used on Large Variety of Tire Operations

AKRON, OHIO, July 16—According to figures given out by the labor department of the Goodyear Tire & Rubber Co. nearly 3000 women and girls are now employed in that plant, many of whom are doing work which requires a high degree of skill. It is estimated that women are now turning out 20 per cent of the company's products.

Among the things which the women are doing are finishing tires, cutting and splicing fabrics for balloons, weighing rubber, molding and trimming rubber heels, operating industrial trucks, making gas masks, operating refining and straining machines in reclaiming rubber, running rubber-washing machines, splicing and trimming tire tread bands, separating rubber sheets that become stuck together in the long voyage from the crude rubber plantations, and making tubes.

It is interesting to note that since the close of the school year there has been quite a decided influx of school teachers. Many of these teachers have been prompted to seek work in the factory by a desire to perform a patriotic duty at this particular time. Others are influenced undoubtedly by the fact that a high wage rate may be earned.

It has been found that the work of the women is done as efficiently as it was by men. There are, however, certain operations which they are unable to perform. For example, they work on tire finishing with the men, but they have been found physically unable to carry the heavy metal cores on which the tires are built. This part of the work is therefore still done by men, and the women's rate of pay in this department is determined by the portion of the work which they actually perform. In cases where they work independently of other help they are paid the same as men for the same work.

More than 4600 men have left the company since the beginning of the war to enter Federal service.

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New York Closing Saturday Afternoons

NEW YORK, July 13—Following the affiliation of the Automobile Dealers' Assn. of New York City with the National Automobile Dealers' Assn., the dealers here have voted to close their establishments at 1 o'clock Saturdays, beginning to-day. The service stations generally have been closed Saturday afternoons, the shops working 48 hours a week on a plan which made a half holiday possible.

Following the meeting July 1, at which the New York dealers joined the N. A. D. A., eight new members have been received, the local membership now including practically the entire row.

Tractor Show Lists Filling

Twenty-six Makers of Tractors, 9 of Implements and 16 Accessories Signed Up

SALINA, KAN., July 12—The list of accessory and implement manufacturers who will exhibit at the National Tractor Demonstration July 29 to Aug. 3, is growing steadily larger. So far, 26 tractor, 9 implement and 16 accessory manufacturers have signed up. The list follows:

Tractors

Avery Co.	Peoria
Square Turn Tractor Co.	Chicago
Hart Parr Co.	Charles City
Holt Mfg. Co.	Peoria
Nilson Tractor Co.	Minneapolis
Moline Plow Co.	Moline
Dauch Mfg. Co.	Sandusky
Parrett Tractor Co.	Chicago
Russell Co.	Massillon
Gile Tractor & Engine Co.	Ludington
Advance Rumely Thresher Co.	La Porte
Aultman & Taylor Machine Co.	Mansfield
Rock Island Plow Co.	Rock Island
Gray Tractor Co.	Minneapolis
La Crosse Tractor Co.	La Crosse
Cleveland Tractor Co.	Cedar Rapids
Hession Tiller & Tractor Co.	Buffalo
Four Drive Tractor Co.	Big Rapids
Velie Motor Corp.	Moline
American Tractor Co.	Peoria
Lyons-Atlas Co.	Indianapolis
J. I. Case T. M. Co.	Racine
Emerson-Brantingham Co.	Rockford
Wallis Tractor Co.	Peoria
Frick Tractor Co.	Wainsboro
Waterloo Tractor Co.	Waterloo

Implements

P. & O. Plow Co.	Ancton
Oliver Chilled Plow Works	South Bend
John Deere Plow Co.	Moline
Grand DeTour Plow Co.	Dixon
Vulcan Plow Co.	Evansville
South Bend Chilled Plow Co.	South Bend
Turner Mfg. Co.	Fort Washington
La Crosse Plow	La Crosse
I. H. C. Co.	Chicago

Accessories

McQuay-Norris Mfg. Co.	St. Louis
Hyatt Roller Bearing Co.	Chicago
Timken Roller Bearing Co.	Canton
Diamond Chain Co.	Indianapolis
Am. Manganese Steel Co.	Chicago
Buda Motor Co.	Harvey
Sumpter Electric Co.	Chicago
Bosch Magneto Co.	New York
K-W Ignition Co.	Cleveland
Modine Radiator Co.	Racine
Hooven Radiator Co.	Chicago
Vacuum Oil Co.	New York
Gurney Ball Bearing Co.	Jamestown
Automotive Parts Co.	Indianapolis
S. K. F. Ball Bearing Co.	Hartford
R. D. Nuttall Co.	Chicago

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Walnut Needed For Propellers

WASHINGTON, July 16—American walnut is needed for airplane propellers. The Bureau of Aircraft Production has said that years of test in the present war has proved that walnut is the best material for propeller manufacture and is soliciting mills and individuals to increase the Government walnut supply.

The Government does not buy walnut directly. Mills holding Government contracts for propellers purchase the walnut trees and logs and the Government is urging the owners of these trees and logs to sell them to the saw mills. Owing to their inability to purchase sufficient walnut logs, the saw mill proprietors have not been able to supply the present requirements of the Allies.

"Fight with your walnut trees" is the slogan used in the publicity campaign of the Hardwood Section of the Bureau of Aircraft Production. It is pointed out that 6 walnut trees will provide lumber for a propeller and supply gun stocks for a platoon of infantry.

Any one with walnut trees 12 in. or more in diameter can learn where to sell them by addressing the Hardwood Section, Bureau of Aircraft Production, or the Production Division, Small Arms Section, Ordnance Department.

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Purchasing Control System Planned

WASHINGTON, July 17—A system of control designed to protect the Government in the procurement of all war materials will soon be operated by the Department of Justice in conjunction with the War Department. A board of control will be appointed which will review every contract. Centralization of purchases of each commodity under a single bureau will be arranged in a manner similar to the present plan whereby all motor trucks are purchased by the Motor Transport Service. Contract clauses will be standardized. A daily fiscal survey of Government requirements will be made both for the information of the War Department and the public.

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To Prevent Resale of Steel

WASHINGTON, July 17 — Certain manufacturers on the preference list for steel supply, are reselling steel that has been delivered to them as a result of Government priority assistance, according to the War Industries Board. To prevent such abuses of the priority privilege the Board passed a resolution yesterday that if any such resales made hereafter without the approval of the director of steel supply of the War Industries Board, the manufacturer who is responsible for these resales will be dropped from the preference list and receive no further priority assistance.

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Air Mail Expansion Planned

WASHINGTON, July 17—Rapid expansion of the air mail service with eventual country-wide scope will begin August 1, when the air mail service will pass from the War Department to exclusive post office control. College Park Aviation Field, 8 miles from Washington, has been selected as the new Washington terminal. Motorcycle delivery will be made from that point to the city. Army aviators returning from the war will have the preference in this service.

The first flight under the new system will begin August 1 when it is possible that another reduction in service charges from 6 cents per ounce to 3 cents per ounce with the usual 10 cent special delivery charge will be announced.

It is also planned to shortly inaugurate and 8 hour aerial mail route from Chicago to the East.

South Africa Cars Sent from U. S.

More than Half of All Imported Vehicles and Parts Come from America

JOHANNESBURG, SOUTH AFRICA, June 21—In the annual customs returns of South African imports for 1917, the value of cars, trucks, parts, motor cycles, tires and gasoline totals $10,237,970 as compared with $8,830,040 in 1916, or an increase of 25 per cent. Of the 1917 amount, $4,500,000 was sent by the United States.

Under the head Motor Imports, South Africa includes not only cars, trucks, motor cycles and parts, but also tires and motor fuel. Of the total amount of passenger cars imported, 2596 valued at $2,063,125 came from the United States in 1917 as compared with $2,790,970 in 1916. The value of trucks likewise decreased from $125,180 in 1916 to $33,640 in 1917. The only item imported from the United States which increased in value in 1917 was motor fuel, including benzine and naphtha. In 1917, 4,589,896 gallons at a cost of $1,383,770 were imported as compared with 3,204,474 gallons valued at $893,360 in 1916.

U. S. Leads Exports

Despite the reduced amount of imports from the United States last year, in each case that amount was larger than shipments from all other countries combined, or more than 50 per cent of the total.

Passenger car shipments from Canada came second to those of the United States, having a value of $960,000. Imports from all other countries besides Canada amounted to only $21,000, making the total value of passenger cars sent from all countries other than the United States $981,000, or less than half those from the United States. The difference in trucks was even greater, proportionally. United States imports were $682,320 as compared with all other imports of $3,480. In the matter of chassis, the United States and Canada sent approximately the same amount.

Imports Into South Africa of Cars, Trucks and Parts.

	1917	1916
Passenger Cars.		
United States	$2,063,125	$3,847,705
All other countries	981,885	1,156,735
	$3,045,010	$6,004,430
Motor Trucks.		
United States	$33,640	$125,180
All other countries	3,480	29,235
	$37,120	$154,415
Parts		
United States	$56,862	.....
All other countries*	55,065	.....
	$111,927	
Grand total	$3,194,057	$4,002,120

*1916 *amount included with car and truck import figures.*

Michigan to Have Rural Express

Lines to Run from Lansing to Grand Rapids—Another Line to Center in Flint

LANSING, July 15 — In co-operation with the Federal Government to relieve railroad freight congestion and the State efforts to bring about the organization of rural motor express lines and return load bureaus, preparations have been made for the operation of such a line between Lansing and Grand Rapids. One Lansing company which owns several large motor trucks has informed Secretary Wickham of the Michigan Highways Transport Committee that its trucks will be available.

The plan of the Rural Express, which has been adopted in several States, is to organize routes for trucks between the principal cities and towns of the State. While the State will not be financially interested in the proposition, the committee appointed by the governor will assist in picking out the route, interest owners of trucks in the proposition and help the various Chambers of Commerce in organizing the Return Load Bureaus. The owner of a truck in the Rural Express system picks up the farm produce along his route, and in some instances he buys outright from the farm and sells the produce in the city. In other cases he receives a certain rate for transporting it to its destination. At the same time he takes orders for such goods as the farmer needs in town and delivers them to the farmer on his return trip.

Where the rural motor express companies do the transportation work for the big manufacturers between cities, the Return Load Bureaus have an opportunity to co-operate. For instance, if a truck should leave Lansing with a consignment for Grand Rapids, the Return Load Bureau in that city would be expected to get in communication with the manufacturers of that city and provide a load for the truck on its return trip.

Truck Freight Line Centers in Flint

Plans have already been perfected by the traffic department of the Flint Board of Commerce whereby this city will become the center of a large transportation organization providing truck freight service for all of this section of the State. The first trucks to start out loaded in this new system left Detroit yesterday and will return with freight for Detroit to-morrow. Early next week freight service will start between Flint, Saginaw, Bay City and Alma, and at the same time truck service will start between Flint and Owosso, and Flint and Lansing.

Four trucking companies have been brought together in this new system which will practically work as one unit, with an interchange of freight service, so that through shipments may be made from any point to another. The towns to be served include Ann Arbor and intermediate points between that city and Pontiac, where transfers will be made on the Detroit-Flint line, Holley, Fenton, Linden, Mt. Morris, Clio, Birch Run, Saginaw, Bridgeport, Frankenmuth, Bay City, Alma, Owosso, Corunna, Lansing, Fowlerville, Durand and smaller towns.

More Rural Express Lines Started

NEW YORK, July 17—The National Automobile Chamber of Commerce is continuing to carry out its plan of urging and assisting in the establishment of rural express lines, and in harmony with this work, companies are steadily being established for this purpose. In Omaha, the Ford Livery Co. has purchased 3 trucks to act as forerunners to a fleet of between forty and sixty. These will be put in operation shortly, and haul freight both in and out of Omaha.

A corporation has been formed in Mason City, Iowa, which will purchase trucks and operate them on routes leading out of the city. The towns to be covered have a population of 89,900, and there are 1876 farms on the routes as well as 5628 within a mile of them.

In Chattanooga, Tenn., the Glaser Hauling Engineering Co. has opened a terminal and will run trucks to Knoxville, Atlanta, Birmingham, Memphis, Nashville and other cities.

A transportation club was formed in Elizabeth, N. J., last week, and already 32 tons of merchandise have been hauled between there and Philadelphia. A Return Loads Bureau has been established in connection with the rural express line.

More Cars Are Sent Via New York

Nearly Half of All Automotive Exports of United States Go Through Metropolis

NEW YORK, July 17—The proportion of automobiles, trucks and parts shipped from the port of New York to the total automotive exports from the United States is again increasing. It was 43 per cent in May as compared with only 24 per cent in April, an increase of almost 100 per cent. The percentage, however, is still below normal, comparing unfavorably with a proportion of 46 per cent in March, 61 per cent in February and 71 per cent in January.

Automobiles, trucks and parts shipped from New York in May totalled $3,339,558 as against $2,396,448 in April. May exports as a whole were 22 per cent less than those for April.

The total value of passenger cars shipped from New York was $1,289,109; that of trucks $1,280,606, and parts $769,843. The proportion of parts continues to increase steadily, being 9 per cent greater in May than April, which was the record until that time.

The largest individual shipment was one of 100 trucks valued at $382,899, to Scotland. A shipment of 110 trucks valued at $355,301 to France followed.

France also received the greatest number of passenger cars.

Automobile, Truck and Parts Exports from New York for May

	Cars		Trucks		Parts
	No.	Value	No.	Value	Value
Argentina	...	....	...	....	$51,661
Australia	161	$140,361	2	$1,675	43,301
Barbados	...	....	1	2,800	218
Bolivia	4	2,400	...	....	540
Brazil	70	64,490	1	1,539	29,806
British East Africa	...	....	...	....	625
British Guiana	3	4,086	...	....	736
British India	...	....	...	....	15,854
British Oceana	...	....	...	....	49
British South Africa	70	68,250	...	....	9,019
British West Africa	19	11,028	2	2,048	2,474
British West Indies	...	....	...	....	2,357
Chile	93	159,729	9	15,045	60,137
China	5	13,089	...	....	1,489
Colombia	12	12,284	...	....	851
Costa Rica	...	....	...	....	100
Cuba	80	58,803	48	116,963	40,792
Danish West Indies	...	....	...	....	125
Dutch East Indies	...	....	...	....	218
Dutch West Indies	3	2,208	...	....	281
Ecuador	17	13,893	...	....	1,649
England	6	10,754	97	286,318	109,807
France	108	365,375	110	365,301	303,337
French Africa	39	20,057	...	....	1,821
French West Indies	10	10,215	1	3,616	906
Greece	2	20,000	14	32,000	....
Guatemala	1	1,008	...	....	194
Hayti	30	16,691	2	1,200	4,062
Honduras	...	....	...	....	1,647
Italy	...	....	...	....	3,409
Jamaica	6	5,508	...	....	5,564
Japan	63	75,783	14	14,480	21,622
Mexico	77	61,394	8	12,272	11,178
Newfoundland	10	15,667	...	....	668
New Zealand	...	....	...	....	385
Nicaragua	2	1,341	...	....	....
Norway	2	2,800	...	....	....
Panama	5	4,319	6	3,600	6,195
Peru	33	36,667	19	29,774	6,873
Portugal	5	16,250	...	....	603
Salvador	7	5,954	...	....	237
San Domingo	9	19,530	...	....	3,928
Scotland	...	....	100	382,899	....
Spain	30	48,596	2	5,506	6,425
Switzerland	...	....	...	....	54
Trinidad	4	3,171	...	....	3,439
Uruguay	...	....	...	....	7,033
Venezuela	27	17,558	2	12,200	7,857

Ford Buys Factory Site for Tractor Assembling Plant

DEARBORN, MICH., July 15—Henry Ford & Son has bought a large water power site in Hamilton, Ohio, where the company will erect a plant for the assembling of Fordson tractors. Construction will start in 30 days. It is expected the company will be in production within 90 days. A similar site has been purchased in New England, the exact location of which has not been announced.

With the acceptance of an additional order from Illinois for 3000 Fordson tractors, the production of the Dearborn plant is entirely sold out for the next year. Orders on the books of the company aggregate 50,000 tractors and no further orders are being accepted. Production is steadily increasing and before the end of the month a daily output of 150 tractors will have been reached.

Instead of having branches, the company intends to establish tractor plants all over the country. The Ohio and New England plants will assist in supplying some of the 50,000 tractors now on order.

Foreign shipments are being made to Peru, Japan, Africa, Fiji Islands, Sumatra, Java, Ceylon and the Philippines. The company is experimenting with packing for foreign shipments, and striving to reduce the cubical contents of its cases with the least amount of disassembling of its tractor.

—

Ford Chaser Plant at Kearny, N. J.

WASHINGTON, July 15—Henry Ford will build a large plant at Kearny, N. J., for the manufacture of submarine chasers for the Navy. It is said that this will be the largest plant of its kind in the world. The first of the Ford chasers being completed at Detroit will be delivered next month.

—

New Plant for Master Trucks

CHICAGO, July 15—Work will start shortly on the new plant of Master Trucks, Inc. A large tract of land has been purchased and details of construction are being worked out now. The company is making two trucks and a tractor, the bulk of the business, however, being on the 2-ton chassis.

—

Overland Plant in Walkerville

DETROIT, July 16—Willys-Overland, Inc., will establish a branch manufacturing plant in Walkerville, Ont. It has signed a 3-year lease for the buildings recently occupied by the Gramm Motor Co. and will begin operations some time in August.

—

American Motor Truck Sold

DETROIT, July 16—The American Motor Truck Co. was sold at auction June 27 by the Detroit Trust Co., receivers for the company, for approximately $32,000. The personal property was sold in divided lots for $22,000. The real estate, represented by an equity in a contract, was bought by Frank Bros. for $10,000. The purchaser will assume payments on the unpaid balance. The entire contract is worth $35,000 on which $17,000 has been paid. The book liabilities of the company total $50,000. This does not include the unliquidated claims. After these are filed it is believed the total will reach much in excess of $75,000. The defunct company had been in operation only a short period—about a year or so—and it is said that only ten trucks were built during that time.

Current News of Factories

Notes of New Plants—Old Ones Enlarged

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Employees Insured by Page Steel

ADRIAN, MICH., July 17—The Page Steel & Wire Co. has perfected arrangements whereby every employee who has been in the service of the company for 3 months is insured to the amount of $500, payable at his death to whomever he may direct the policy to be issued. The entire expense of the policy is paid by the company. The insurance will apply to the employees in the Adrian plant and also in the Detroit, Chicago and Monessen factories.

—

Clubhouse for Falls Employees

MILWAUKEE, July 15—The Falls Motors Corp., Sheboygan Falls, Wis., has turned over to its 500 or more employees a clubhouse for their exclusive use and benefit. The club is provided at the expense of the company for entertainment and to promote educational, literary, musical and athletic activities. The club contains a library and reading room, pool and billiard hall, an auditorium for dancing and theatricals, and several smaller rooms for conferences and group meetings. The basement is provided with bowling alleys and gymnastic apparatus. Tuesday evening has been set aside for the exclusive use of the facilities by the female employees and their guests.

—

Free Movies for Rubber Workers

AKRON, OHIO, July 16—As an extension of its welfare work, The Goodyear Tire & Rubber Co. is giving free outdoor moving picture shows for the benefit of its employees. The company's athletic field is used for the purpose, and pictures are shown there twice each week. The subjects shown are the popular comics, war films, good dramas, and a weekly pictorial review of Goodyear activities.

—

A. Nelson Mfg. Co. Moves

CHICAGO, July 12—The A. Nelson Mfg. Co. has moved to its new building at 2662 Southport Avenue.

Chandler Awards Contracts for Two Tractor Buildings

CLEVELAND, July 13—The Chandler Motor Car Co. has awarded contracts for the erection of two more tractor buildings and the enlargement of its two office buildings here. The work will be completed as soon as possible.

—

Bearing Plant Output to be Doubled

TOLEDO, July 13—The Bock Bearing Co. soon will complete plans for extensions to its plant. It is expected that the capacity will be doubled by early winter, and that by 1921 it will be increased at least five times. The company now employs 800, and by winter this number will be increased to 1,000. The enlargement is due to the government's recent specifications of Bock bearings for all army trucks and automobiles. The company is a subsidiary of the Standard Parts Co., Cleveland.

—

Gary Motor Truck Expands

GARY, IND., July 17—The Gary Motor Truck Co. has increased its capital from $175,000 to $1,000,000, and has perfected plans for the erection of an addition to its plant which will increase production from the present rate of 500 vehicles a year to 1500. The financial reorganization does not entail any change in management or policy.

—

Republic Establishes Baltimore Branch

BALTIMORE, July 15—The Republic Motor Truck Co., Alma, Mich., has opened a factory branch here and taken over the business of Habersham-Miller, Inc. L. Van Bunkirk, formerly of the Studebaker Corp., is president of the reorganized company, which will retain its former style. Herbert L. Charlack is vice-president and A. J. Kenny secretary-treasurer. They have all been associated with the Republic organization for some time.

—

Metal Auto Parts Organized

DES MOINES, July 17—The Metal Auto Parts Co. has been organized here to manufacture accessories for cars. Jack Messenger has been elected president; T. A. Tooey, vice-president; E. M. Messenger, secretary, and C. A. Messenger, treasurer.

—

Sandusky Tire Breaks Ground for Plant

SANDUSKY, OHIO, July 12—Ground was broken to-day for the plant of the recently organized Sandusky Tire & Rubber Co. This will be completed within 6 months, and approximately 200 men will be employed.

—

Comet in New Plant

DECATUR, ILL., July 15—The Comet Automobile Co. has moved into its newly constructed plant at William Street and Broadway. The construction of cars and trucks is being rushed.

Dent Parrett a Captain in the Ordnance Department

CHICAGO, July 16—Dent Parrett, president of the Parrett Tractor Co. has been commissioned a captain in the Ordnance Department. He will work in Peoria on the co-ordination of engineering, production and inspection in the factories of the middle west that are building tractors for the Ordnance Department. The directors of the Parrett company were unanimous in permitting Captain Parrett to retain the presidency of the company, and accept his commission in the service.

—

Capt. Lawrence H. Earle, on duty for the past year as government inspector at the Holt Works, East Peoria, Ill., has been transferred to Washington as supervisor of tractors and tanks in the Ordnance Department. He has been succeeded in East Peoria by Capt. T. A. Collins.

—

H. S. Johnson, western district representative for the automobile equipment department of the Westinghouse Electric & Mfg. Co., has resigned and has become associated with the Ansted interests, manufacturing the Lexington car and the Teeter engine. He will be located at the plant of the Teeter-Hartley Motor Co., Hagerstown, Md.

—

E. W. Beach, president of the Manufacturers' Foundry Co., Waterbury, Conn., and a member of the board of directors and executive committee of the Motor and Accessory Manufacturers' Assn., has been appointed to a position in the inspection department of the Bureau of Aircraft Production. The work will take his entire time.

—

J. E. Allen, for several years manager of the Chicago branch of the Braender Tire & Rubber Co., has been made sales manager. He will make his headquarters at the factory in Rutherford, N. J.

—

J. B. Wyckoff, who was advertising manager for the Colt-Stratton Co., New York, Dodge Brothers distributer, has resigned. He has been appointed assistant business manager of The Nation's Business, Washington, and will take up his new duties Aug. 1.

—

F. A. Mansfield, for the last 12 years associated with the export and industrial departments of the Westinghouse Electric & Mfg. Co., has resigned to become manager of the Pittsburgh office of the Mechanical Appliances Co., manufacturer of motors and generators.

—

J. H. Amory has succeeded A. G. Thomson in the automobile lubrication sales division of the Joseph Dixon Crucible Co., Jersey City.

—

Edgar H. Dowson, vice president of the White Motors Co., White and Buick distributer in New Haven, Conn., has been appointed first lieutenant in the Quartermaster Corps. He is stationed at Camp Holabird, Baltimore, in command of the Watertank division of a motor train.

—

J. M. Griffin has been appointed sales manager of the Kerosene Equipment Co., Detroit. He was formerly with the General Electric Co., Schenectady, N. Y., and later with Holley Bros., Detroit.

—

J. F. Cast, of the Firestone Tire & Rubber Co., Akron, has been promoted to assistant manufacturers' sales manager, a new position made necessary by the growth of this department. He has been with the company as salesman, branch manager and special representative since 1910.

—

C. P. Henderson, for the last 8 years general sales manager of the Cole Motor Car Co., Indianapolis, has resigned to assume the management of the company's western sales. J. E. Roberts, formerly western district manager has been promoted to general sales manager.

—

H. R. Hyman, for several years advertising manager of the Cole Motor Car Co., Indianapolis, has been appointed promotion department manager to succeed J. D. Riker who has resigned. Mr. Hyman will continue his duties as advertising manager in addition to the new work.

—

L. T. Miller, formerly assistant purchasing agent of the Detroit Steel Products Co., has been appointed purchasing agent for the Elgin Motor Car Corp., succeeding F. X. Devlin, resigned.

—

H. S. Ketcham, sales manager of the manufacturer's division of the Bradfield Co., has resigned. He has been appointed New England zone manager of the Cleveland Tractor Co., with headquarters in Boston.

—

E. D. Rogers has been appointed district sales manager of the Beck-Hawkeye Motor Truck Co., Cedar Rapids, Iowa, for the states of Texas, Oklahoma, Arkansas and Louisiana.

—

Harry J. Warner, former vice-president of the Continental Motor Co, has associated himself with the organization of the Federal Truck Co. He will act as vice-president in charge of production.

—

Fenn H. Fossick, assistant advertising manager of the Nash Motor Co., has resigned. He will take up special work in connection with the motor equipment section of the Ordnance Department.

Men of the Industry

Changes in Personnel and Position

H. W. Davis Made President of Emil Grossman Mfg. Co.

NEW YORK, July 15—Changes have been made in the management of the Emil Grossman Mfg. Co., Brooklyn. H. W. Davis, who is vice-president of the Finance & Trading Corp., 43 Exchange Place, has succeeded Emil Grossman as president; K. P. Collins, who is also connected with the Finance & Trading Corp., has been made vice-president succeeding L. M. Schwarz.

—

Fred Berger, formerly chief engineer of the Oakland Motor Car Co., Pontiac, and sales manager of the Muir Carbureter Co., and later chief engineer of the Abbott Motor Corp., Cleveland, has been appointed chief engineer of the Gray Motors Co., Detroit.

—

E. W. Hurd has been advanced from assistant sales manager of the Premier Motor Corp., Indianapolis, to director of sales. The promotion was made following the death of P. D. Stubbs, the former director of sales.

—

H. E. Mahaffey, who has been acting as assistant manager of the branch of the Oakland Motor Car Co., in Cleveland, has been transferred to the Omaha branch, where he will serve in a similar capacity. Before joining the Oakland company, he was general sales manager of the Gray Tractor Co., Minneapolis.

—

Blaine McGrath has succeeded Hi Sibley an advertising manager of the Republic Motor Truck Co., Alma, Mich.

—

H. G. MacEachen, formerly western division manager of the Firestone Tire & Rubber Co., Akron, has joined the Veterinary Department of the United States Army.

—

J. Walter Drake, president of the Hupp Motor Car Corp., Detroit, has been appointed chairman of the Wayne County War Board, succeeding A. A. Templeton.

—

Columbus Tractor Adds to Personnel

COLUMBUS, OHIO, July 14—The Columbus Tractor Co. has made several additions to its personnel. E. B. Moon has been appointed director of sales and advertising; Gebhard Jaeger, manufacturer of concrete mixers, will be production manager and general superintendent. Frank H. Nagle, formerly general manager of the Toledo Stove & Range Co., has been appointed assistant secretary and treasurer, in charge of purchasing and accounting, and Walter A. Jones, president of the United States Window Glass Co. and vice-president of the Columbus Chamber of Commerce, will be chairman of the board of directors.

—

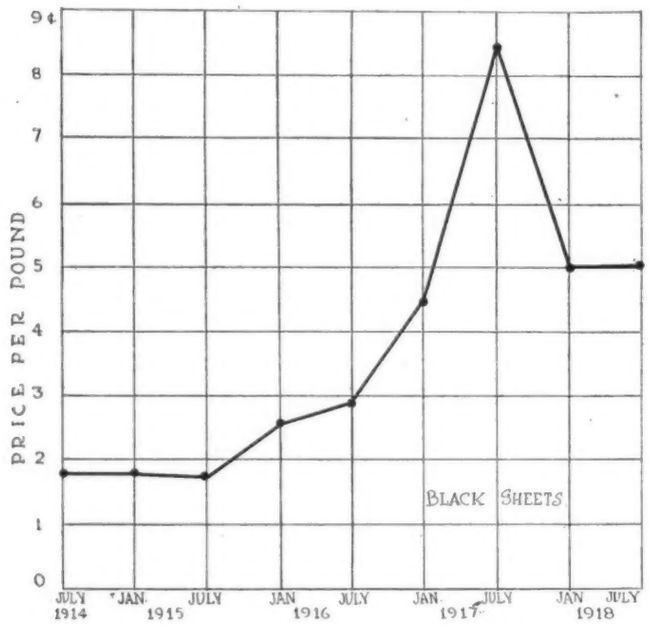
Dr. Edgar Marburg Dies

PHILADELPHIA, July 15—Dr. Edgar Marburg, secretary-treasurer of the American Society for Testing Materials since its incorporation in 1902, died recently.

AUTOMOTIVE MATERIALS MARKETS

Material Market Prices

Acids:
Muriatic, lb. ..... .02-.03
Phosphoric, ct. .... .35-.39
Sulphuric (60), lb.. .11
Aluminum:
Ingot, lb. ..... .33
Sheets (18 gage or more), lb. ..... .40
Antimony, lb. ..... .13-.13¼
Burlap:
8 oz. yd..... .18½-.19
10 oz., yd..... .23½-.24
Copper:
Elec., lb. ..... .26
Lake, lb. ..... .26
Fabric, Tire (17¼ oz):
Sea Is., combed, lb. 1.65-1.70
Egypt, combed, lb. 1.25-1.35
Egypt, carded, lb.. 1.20-1.30
Peelers, combed, lb. 1.05-1.20
Peelers, carded, lb. .95-1.05
Fibre (⅛ in. sheet base), lb. ..... .50
Graphite:
Ceylon, lb. ..... .07½-.25
Madagascar, lb. ... .10 -.15
Mexican, lb. ..... .02⅝
Lead, lb. ..... .07¾-.08⅛
Leather:
Hides, lb. ..... .19-.33
Nickel, lb. ..... .40
Oil:
Gasoline:
Auto., gal. ..... .24
68 to 70 gal..... .30
Lard:
Prime City, gal. 2.20
Ex. No. 1, gal.. 1.50-1.52
Linseed, gal. 1.65
Menhaden, gal. .. 1.05
Petroleum (crude):
Kansas, bbl. ... 2.25
Pennsylvania, bbl. 4.00
Rubber:
Ceylon:
First latex pale crepe, lb. .... .63
Brown, crepe, thin, clear, lb. ..... .60
Smoked, ribbed sheets, lb. .... .62
Para:
Up River, fine, lb. .68
Up River, coarse, lb. ..... .40
Island, fine, lb.. .59
Island, coarse, lb. .27
Shellac (orange), gal. .70-.76
Spelter ..... .09¾-.10½
Steel:
Angle beams and channels, lb. .... .03
Automobile sheet (see sp. table).
Cold rolled, lb..... .06½
Hot rolled, lb.... .03½
Tin ..... .95
Tungsten, lb. 2.00-2.40
Waste (cotton), lb.. .12¾-.17



The variations in the price of black sheets during the last 4 years may be taken as an indication of the manner in which prices of the higher grades increased before Government regulations went into effect

AUTOMOBILE SHEET PRICES

(Based on No. 22 Gage. Other gages at usual differentials)

	Primes only. Per 100 lb.	Primes when seconds up to 15 per cent are taken. Per 100 lb.	Seconds arising.
Automobile body stock	$5.95	$5.85	*See Note
Automobile body stock, deep stamping	6.20	6.10	
Automobile body stock, extra deep stamping	6.45	6.35	
Hood, flat fender, door and apron, or splash guard stock	6.05	5.95	
Crown fender, cowl and radiator casing, deep stamping	6.30	6.20	
Crown fender, cowl and radiator casing, extra deep stamping	6.55	6.45	

Automobile Sheet Extras for Extreme Widths:
Nos. 17 and 18 over 36 in. to 44 in., 10c. per 100 lb.
Nos. 19 to 21 over 36 in. to 44 in., 30c. per 100 lb.
Nos. 22 to 24 over 26 in. to 40 in., 40c. per 100 lb.
Nos. 22 to 24 over 40 in. to 44 in., 80c. per 100 lb.
Black sheet extras to apply to narrow widths.
Oiling, 10c. per 100 lb.
Patent leveling, 25c. per 100 lb.
Resquaring, 5 per cent of gage price after quality, finish and size extras have been added.

*Ten per cent less than the invoice Pittsburgh price for corresponding primes.

Automotive Securities Quotations on the New York and Detroit Exchanges

	Bid	Asked	Net Ch'ge
*Ajax Rubber Co.	63	65	+1
*J. I. Case T. M. Co., pfd.	80	85	—1
Chalmers Motor Co., com.	3	6	+1
Chalmers Motor Co., pfd.	20	30	—5
*Chandler Motor Co.	80	81	—2
Chevrolet Motor Co.	132	135	—3
*Fisher Body Corp., com.	38	39	—6
*Fisher Body Corp., pfd.	89	90	—3
Fisk Rubber Co., com.	55	58	..
Fisk Rubber Co., 1st pfd.	98	103	+1
Fisk Rubber Co., 2nd pfd.	79	83	..
Firestone Tire & Rubber Co., com.	98	101	+10
Firestone Tire & Rubber Co., pfd.	93	95	..
*General Motors Co., com.	152	155	—5
*General Motors Co., pfd.	81	82	..
*B. F. Goodrich Co., com.	45	45½	+ ½
*B. F. Goodrich Co., pfd.	97⅜	98½	—1½
Goodyear Tire & Rubber Co., com.	160	165	—4
Goodyear Tire & Rubber Co., pfd.	96½	97½	..
Grant Motor Car Corp.	2½	3	..
Hupp Motor Car Corp., com.	2⅞	3⅜	— ⅛
Hupp Motor Car Corp., pfd.	78	81	+ ½
International Motor Co., com.	25	35	..
International Motor Co., 1st pfd.	55	60	—5
International Motor Co., 2nd pfd.	35	43	..
*Kelly-Springfield Tire Co., com.	50⅜	51	+1
*Kelly-Springfield Tire Co., 1st pfd.	82	87	..
*Lee Rubber & Tire Corp.	18¾	19	—1
*Maxwell Motor Co., Inc., com.	28	28½	—2¼
*Maxwell Motor Co., Inc., 1st pfd.	54¼	55	—3
*Maxwell Motor Co., Inc., 2nd pfd.	20½	22	..
Miller Rubber Co., com.	103	105	..
Miller Rubber Co., pfd.	92	95	..
Packard Motor Car Co., com.	118	125	+5
Packard Motor Car Co., pfd.	93	96	..
Paige-Detroit Motor Car Co.	18	20	..
Peerless Truck & Motor Corp.	13	17	+1
Portage Rubber Co., com.	102	105	..
Reo Motor Car Co.	13½	15	..
*Saxon Motor Car Corp.	7	8¼	— ¼
Standard Motor Construction Co.	12	14	+1½
*Setwart-Warner Speed. Corp.	59⅜	60¾	+2¼
*Studebaker Corp., com.	45	45½	—1½
*Studebaker Corp., pfd.	84	90	..
Swinehart Tire & Rubber Co.	55	62	..
United Motors Corp.	32½	33½	— ½
*U. S. Rubber Co., com.	60¼	60½	+ ⅜
*U. S. Rubber Co., pfd.	105	106¼	..
*White Motor Co.	41	42	..
*Willys-Overland Co., com.	19¼	19¾	— ¾
*Willys-Overland Co., pfd.	81½	83	..

*At close July 13. Listed N. Y. Stock Exchange.

OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

	Bid	Asked	Net Ch'ge
ACTIVE STOCKS			
Auto Body Co.	..	7¾	..
Bower Roller Bearing Co.	..	18½	..
Chevrolet Motor Co.	132	135	—3
Commerce Motor Co.	..	10½	..
Continental Motor Car Co., com.	5½	5⅝	..
Continental Motor Car Co., pfd.	94	..	..
Edmunds & Jones, com.	14	17	..
Edmunds & Jones, pfd.	80	90	..
Ford Motor Co. of Canada	170	180	..
Hall Lamp Co.	12¾	..	..
Michigan Stamping Co., com.	12¾	..	..
Motor Products	..	..	..
Packard Motor Car Co, com.	120	123	..
Packard Motor Car Co., pfd.	93½	..	+ ½
Paige-Detroit Motor Car Co.	..	19	..
Prudden Wheel Co.	..	12⅛	..
Reo Motor Car Co.	14	14¼	+ ¼
INACTIVE STOCKS			
Atlas Drop Forge	..	26	..
Kelsey Wheel Co.	25	..	—65

Industrial Review of the Week

A Summary of Major Developments in Other Fields

Margin of Steel Output and Requirements Narrowed

Washington has given no sign that ordinary consumers of steel will get larger allowances under the War Board's recent statement. Later checking of figures furnished by the Government and its Allies really narrows the margin between probable output in the second half of the year and the requirements for war. Leading steel manufacturers up to this week have taken the view that the situation would be easier in a few months. They are less confident of that now.

Actual procedure under the new classification of orders is not far from what has been followed. Some producers are even more exacting than before, now that they are asked by the Government to decide as to precedence in shipment.

It now appears certain that open-hearth steel output of the country will be practically taken up by war and essential needs for the remainder of the year and that whatever permits are given for general or class D purposes must be filled almost entirely with Bessemer steel.

The plate mills keep on producing at a yearly rate of 6,000,000 tons, a recent week showing 114,000 tons, while new capacity may bring the rate up to 7,000,000 tons a year by January.

Data are being gathered on which a question may be raised with the British Mission as to the nature and extent of British exports of steel. The Canadian steel trade is involved in a measure also. Some Canadian steel has been sold in New England at high prices, to a non-essential industry, yet large shipments of American steel are being made to Canada at control prices. An amicable exchange on the whole question is possible, in view of the considerable amounts of American steel for which Great Britain has asked. Interesting in the same connection are recent reports of easier conditions as to steel supply in the Birmingham and Sheffield districts of England.

Jobbers are finding that they cannot replace their stocks except in so far as these went to fill war needs, and few warehouses are likely to get back to more than 50 per cent of normal tonnage.—*Iron Age.*

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Detroit Plane to Make Flight

DETROIT, July 17—The first battle plane built entirely in Michigan will be flown to-morrow. According to arrangements the plane will fly from Detroit to Flint, leaving Detroit at 10.30 a. m. and landing at its destination at 11.30. Flint is 68 miles from Detroit. The plane will be piloted by Lieut. Lewis and a member of the Aviation Corps will be in the bomber's seat. The machine is the De Haviland fighting and bombing type, equipped with a Liberty engine. The body was constructed entirely at the plant of the Fisher Body Corp. Arriving at Flint, it is planned to have Lieut. Lewis give an aerial demonstration of fighting tactics before 12,000 employees of the Buick Motor Co.

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Ford & Son Shares to Be $100

DEARBORN, MICH., July 16—At a meeting of the holders of the capital stock of Henry Ford & Son, according to an application made for an increase in the capital stock from $1,000,000 to $5,000,000, it was decided to divide the stock into 50,000 shares of $100 each. The document states that $4,000,000 has already been subscribed and $1,000,000 paid in cash.

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Saxon Moves Service Department

DETROIT, July 16—So that work can be handled more efficiently, the service department of the Saxon Motor Car Corp. has moved its quarters to the main plant.

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United Motors Service Expands

NEW YORK, July 12—The United Motors Service, Inc., which operates 6 branches and 15 service stations in various cities, has taken over all of the field service work of the manufacturers of Delco, Remy and Klaxon electrical equipment. The general offices of the company have been moved to larger quarters at 782 Woodward Avenue, Detroit.

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Cassidy to Market Fuel Economizer

NEW YORK, July 15—The Edward A. Cassidy Co., which has built up a distributing business in several automotive products, has added a gasoline economizer. The product is Eccolene, which is made by the Eccolene Co., Detroit. This is made of seven oils and is added to gasoline in the ratio of one or two oz. of the product to 5 gals. of gasoline, depending on the size of the engine.

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Lipsner to Superintend Aerial Mail

WASHINGTON, July 16—Captain B. B. Lipsner of Chicago, has resigned his commission in the Army to become superintendent of the United Staes Aerial Mail Service. The position given Captain Lipsner is in anticipation of the ultimate taking over of the service by the Post Office Department with its own equipment and personnel. The equipment and personnel used at present has been loaned to the Post Office Department by the War Department.

The new 16-cent rate, announced earlier, went into effect yesterday. The rate is 16 cents for the first ounce including special delivery service, and 6 cents for each additional ounce.

Wilson Satisfied with Copper Price Agreement

WASHINGTON, July 15—The President has approved the agreement that the maximum price on copper shall be 26 cents a pound, taking effect immediately and subject to revision after Aug. 15. This is an advance of 2½ cents over the former price of 23½ cents. The new price is f.o.b. cars or lighters at the refinery if shipped from eastern refineries, and f.o.b. New York if shipped from western refineries, subject to the additional charges on copper shapes announced early in June.

June production of refined copper, including electrolytic, lake and casting, is estimated at 210,000,000 lbs., as compared with 220,000,000 lbs. in May. Total output for the 6 months ended June 30, 1918, is estimated at 1,220,000,000 lbs., as compared with 1,270,000,000 lbs. for the corresponding period of 1917.

The estimates of the number of pounds of copper production compare as follows:

	1918	1917
January	175,000,000	183,000,000
February	185,000,000	198,000,000
March	215,000,000	225,000,000
April	215,000,000	211,000,000
May	220,000,000	223,000,000
June	210,000,000	230,000,000

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Holmes Forming Truck Company

MT. PLEASANT, MICH., July 15—Milton A. Holmes, for 4 years sales manager and for 2 years vice-president of the Republic Motor Truck Co., Alma, Mich., is at the head of the Transport Truck Co., a $1,000,000 organization which is being formed here. A committee was appointed to investigate Mr. Holmes' proposition. On the strength of this report a stock subscription drive is going on in Isabella County so that the company's operations can start about Oct. 1. Plans call for two buildings, each 700 x 80 ft. The size of the truck to be manufactured has not been officially announced.

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Four Makers Change Prices

NEW YORK, July 17—Following are changes in price which have been made during the past week:

Car	Old Price	New Price
Glide, light six-forty	$1,495	$1,595
Templar, five-passenger	2,085	2,185
*Haynes, model 39	....	1,900
Olympia	1,085	1,240

*New model.

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Aviation Expert Here

WASHINGTON, July 14—Lieutenant-Colonel Sir Henry Fowler, in charge of the Sectional Components of Aircraft, and Assistant Director General of Aircraft Production of the British Ministry of Munitions, has arrived in this country on a special mission concerning airplanes.

Army Truck Contracts Awarded

WASHINGTON, July 14—Awards for parts for the new series model B 3-ton standard Army motor trucks have been made as follows:

June 21, 1918.

The Vichek Tool Co., Cleveland; sets tool bag equipment.

Fairmount Tool & Forging Co., Cleveland; sets tool-bag equipment.

The Hinkley Motors Corp., Detroit; motors.

June 27, 1918.

American Brass & Iron Works, Detroit; gasoline feed pipe shut-off cocks.

Duff Mfg. Co., Pittsburgh; jacks.

Templeton Kenly Co., Chicago; jacks.

June 28, 1918.

Kales Stamping Co., Detroit; gasoline feed pipe clips.

The Hayes Mfg. Co., Detroit; air cleaner assemblies, air cleaner clamp assemblies.

General Motors Co., Flint; transmission front hangers.

Sterling Motor Truck Co., Milwaukee; pedal pads.

Peters Machine Co., Cleveland; universal joints.

June 29, 1918.

Perry-Fay Co., Elyria, Ohio, rear axle worm shaft thrust bearing cover stud, rear axle worm shaft thrust bearing retaining nut, rear axle worm shaft radial bearing lock nut, differential carrier to rear axle housing stud, rear axle worm shaft thrust bearing cover and stud nut, rear axle worm shaft radial bearing cover screw, differential carrier to rear axle housing stud nut, rear axle worm shaft nut, rear axle worm shaft radial bearing spacer (narrow), rear axle worm shaft radial bearing spacer (wide), rear axle worm shaft thrust bearing retaining nut washer, rear axle worm shaft thrust bearing sleeve, rear axle worm shaft thrust bearing spacer.

Globe Machine & Stamping Co., Cleveland; rear axle worm shaft oil thrower (front), rear axle worm shaft oil thrower (rear), rear axle worm shaft thrust bearing retainer nut lock, rear axle worm shaft radial bearing lock nut lock.

National Malleable Castings Co., Toledo; malleable iron castings, No. 1909-Y, rear axle differential carrier; malleable iron castings, No. 1906-W, rear axle worm shaft radial bearing cover; malleable iron castings, No. 1911-V, rear axle worm shaft thrust bearing cover; metal pattern equipment for No. 1909-Y, rear axle differential carrier; aluminum vibrator plate pattern for No. 1911-V, rear axle worm shaft thrust bearing cover; aluminum vibrator place pattern for No. 1906-W, rear axle worm shaft radial bearing cover.

Cleveland Worm Gear Co., Cleveland; No. 1910-Y, axle worm shaft.

Lincoln Brass Works, Detroit; gasoline shutoff cocks.

United States Ball Bearing Mfg. Co., Chicago; radial bearings complete with bronze retainer; special thrust bearings, complete with bronze retainer.

The Prudden Wheel Co., Lansing; sets wheels.

Breeze Mfg. Co., Newark, N. J.; pieces air cleaner to carburetor tube, with paper packing.

July 3, 1918.

Garlock Packing Co., Cleveland; rear axle worm shaft radial bearing cover gaskets.

Hayes Mfg. Co., Detroit; body seat assemblies.

C. R. Wilson Body Corp., Detroit; body seat assemblies.

Orem Motor Protector Co., Baltimore; air clearer assemblies.

Contracts

Quartermaster Awards

WASHINGTON, July 12—The Motor Transport Service of the Quartermaster Department has awarded contracts to the following companies:

Nash Motors Co., Kenosha, Wis.
Grant Motor Car Corp., Cleveland.
Moon Motor Car Co., St. Louis.
Cleveland Tractor Co., Cleveland.

Ordnance Contracts Placed

WASHINGTON, July 12—Following are the firms with whom purchase orders and contracts were recently placed by the Ordnance Department:

Pyrene Mfg. Co., New York.
Empire Tire & Rubber Co., Trenton.
United States Tire Co., Washington.
Nash Motors Co., Kenosha, Wis.
The Stanley Works, New Britain, Conn.
The Four Wheel Drive Auto Co., Clintonville, Wis.
North & Judd Mfg. Co., New Britain, Conn.
Champion Spark Plug Co., Toledo.
Wilson Body Co., Detroit.
Militor Corp., Jersey City.

Marine Contracts Placed

WASHINGTON, July 12—The following are contracts placed by the Marine Corps:

Studebaker Corp. of America, New York, trucks.

Ford Motor Co., Detroit, chassis.

Firestone Tire & Rubber Co., Philadelphia, tires.

The Goodyear Tire & Rubber Co., Akron, tires and tubes.

Ask Bids for 5000 AA Trucks

WASHINGTON, July 15—Bids have been requested by the Motor Transport Service from automobile manufacturers on the AA ¾-ton army truck. Five thousand of these trucks will be purchased. Blueprints and specifications are on view in Washington at the office of the National Automobile Chamber of Commerce, and at the Motor Transport Service offices and in the Book Building in Detroit, Cleveland and Chicago. The AA truck is an adaptation of the General Motors Co. No. 16 ¾-ton truck which has been adopted as previously announced in these columns.

Chicago Quartermaster Branch Discontinued

CHICAGO, ILL., July 17—The Quartermaster's Truck Purchasing Department of this city will shortly be given up and the entire work concentrated in Washington.

Toledo Screw Gets Shell Order

TOLEDO, July 15—The Toledo Screw Products Co. has received another order for 1,000,000 1-lb. shells, complete, for the navy. The contract, with other government work on hand, will necessitate the erection of a $50,000 machine shop, 150 x 32 ft., adjoining the present plant. Work on the addition is to begin immediately.

Milwaukee Speeds War Work

MILWAUKEE, July 15—Wisconsin is one of the first states in the Union to perfect its industrial organization to speed up war work under the plan of regional districting recently adopted by the War Industries Board, Washington. August H. Vogel, regional director for District No. 17, embracing nearly all of Wisconsin, has divided the state into twenty districts, each of which has formed a sectional organization with a chairman and secretary. The most important of these is Section 16, comprising Milwaukee and Waukesha counties, of which Richard P. Tell, president and general manager, National Brake & Electric Co., Milwaukee, and head of the Milwaukee Metal Trades and Founders' Association, has been designated as chairman. The industrial bureau recently established at Washington by Milwaukee business men has been turned over to the regional director to serve the entire state.

Calendar

RACING

July 27 — Chicago. Chicago Speedway.
Aug. 3—Uniontown. Uniontown Speedway Assn.
Aug. 10—Providence, R. I.
Aug. 17—Sheepshead Bay.
Sept. 2—Uniontown. Uniontown Speedway Assn.
Sept. 7 — Chicago. Chicago Speedway.
Sept. 21—Sheepshead Bay.
Oct. 5 — Cincinnati. Cincinnati Speedway.

SHOWS

July 27—Syracuse, N. Y. Tractor Demonstration. New York State Food Commission.
July 29-Aug. 4—Salina, Kan. National Tractor Demonstration. Auspices of National Implement and Vehicle Assn.
Aug. 6—Fulton, N. Y. Tractor Demonstration. New York State Food Commission.
Sept. 2-7—Indianapolis, Indiana. State Fair. Indianapolis Automobile Trade Assn.
Sept. 14-21—Chicago. Automotive and Accessories War Exposition. Municipal Pier.
Oct. 14-27—Dallas, Tex. Seventh Annual Texas Automobile Show. Texas State Fair.
Oct. 16-18—Ottawa, Ont., International Plowing Match, Tractor and Farm Machinery Demonstration. Experimental Farm.

ENGINEERING

Sept. 2—Cripple Creek, Colo. American Institute of Mining Engineers.
Nov. 14-15—New York. Society of Naval Architects and Marine Engineers. Twenty-sixth general meeting. Engineering Societies Bldg., 29 West 39th Street.